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The Far Eastern Review

ENGINEERING + FINANCE + COMMERCE

THE PIONEER IN ITS FIELD

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in Far Eastern Countries.

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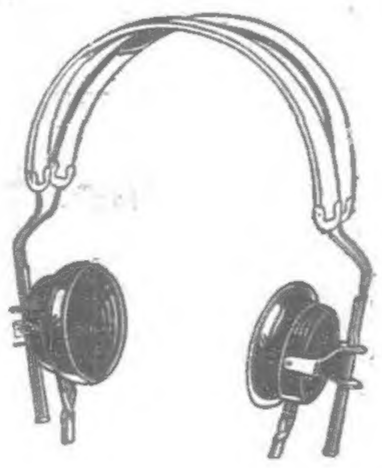
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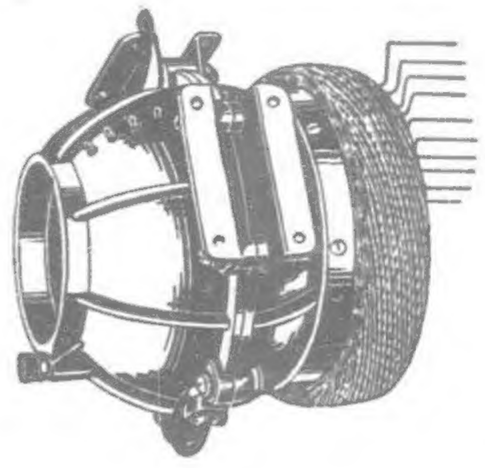
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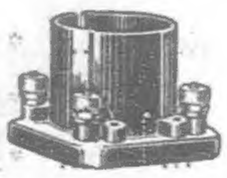
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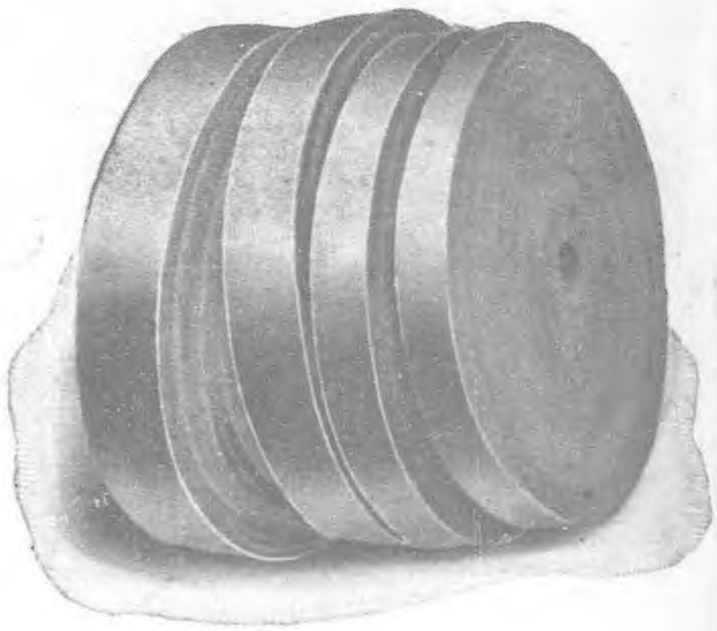
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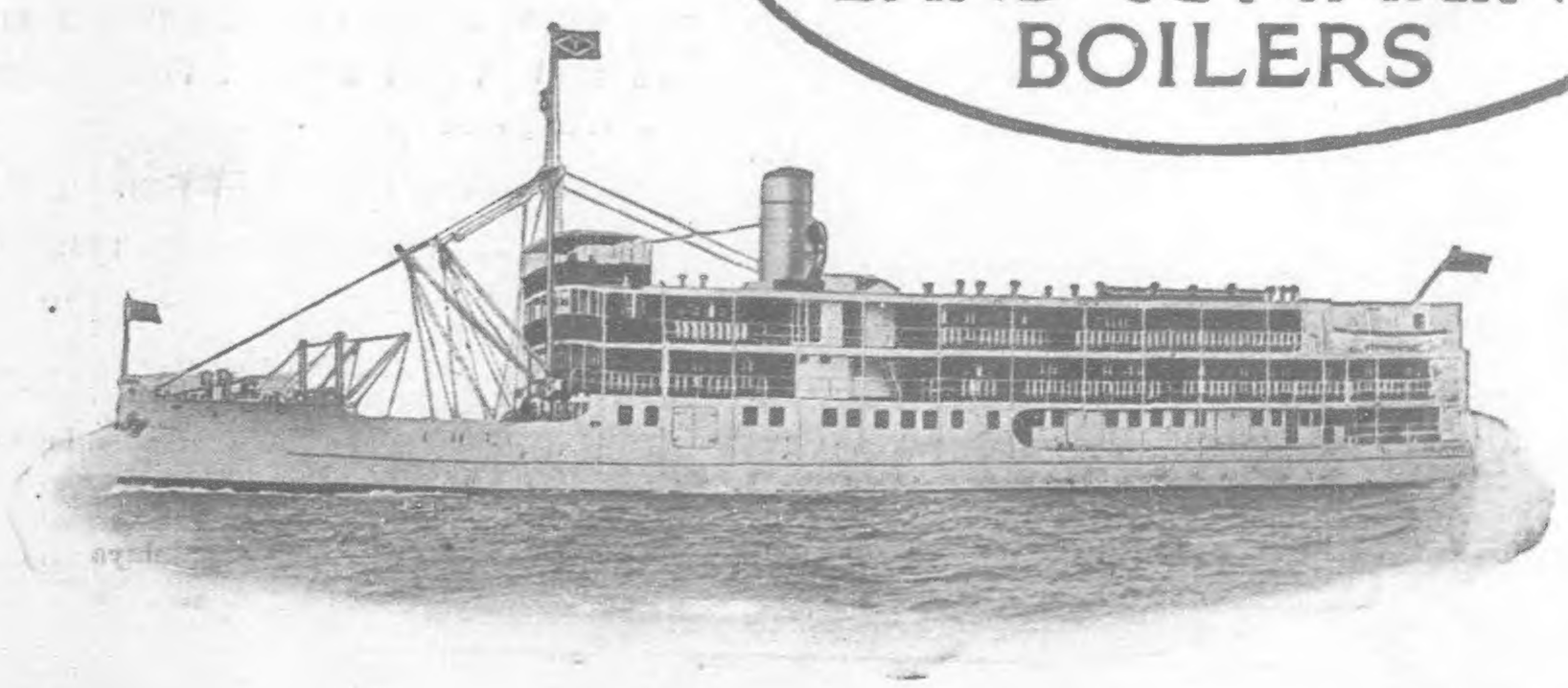
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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XIX SHANGHAI, JULY, 1923 No. 7

Back To Portsmouth?

China's Confession at Washington that she was the Ally of Russia and Responsible for the Russo-Japanese War May Impel Japan to Call for a Re-opening of the Portsmouth Negotiations and Demand the Payment of a Cash Indemnity or the Cession of Manchuria.

WILL the Chinese boycott and agitation against Japan end in overturning the nine-power treaty and changing the map of Eastern Asia? China and her western friends have overlooked the important fact that Japan retains in her hand the joker that will win the last trick. In their madness, the Chinese are seeking further humiliations by re-opening the question of the Kwantung peninsula settled in 1915 as far as Japan was concerned by a treaty which extended their leasehold to 99 years. The Chinese insist that the treaty was extracted under duress, hence invalid, and Japan must get out. Japan says that *all* impairments of China's sovereign rights were inflicted under similar conditions. She stands squarely upon the sanctity of the 1915 treaty.

"Very well," answers China, "we won't discuss the matter further. We will drive you out. You have the bayonets but we have the boycott. You cannot bayonet a boycott. We will kill your trade, make it impossible for your people to reside in and do business in our country, force you into bankruptcy and bring about your downfall from within." Accordingly, China has severed relations with Japan and precipitated a situation equivalent to an open declaration of war. She hugs the delusion that it is impossible to bayonet a boycott, overlooking that it is equally difficult to boycott a bayonet.

The Chinese government side-steps responsibility for the boycott but instructs its provincial authorities "not to interfere with the will of the people." It is a new method of fighting. Officially, there is no war. The pretence of friendly relations is maintained but underneath, all the machinery of the Chinese government is operating to incite the masses to cripple the enemy in his most vulnerable point. Deprived of the Chinese market as an outlet for their manufactured products, the mills of Japan must perforce close down, throwing thousands out of employment, breeding discontent and fomenting disorders that may lead to serious internal revolts and smooth the way for the triumph of Bolschevism. The Chinese hope that these internal troubles will influence the Japanese government to evacuate Kwantung; that the Japanese people faced with economic disaster, will rise and compel compliance with China's demands. Like the Germans, the Chinese are poor judges of human nature. Instead of falling in with the Chinese ideas the Japanese masses, as distinct from their government, may insist upon employing the bayonet as an unanswerable argument to the boycott. As the Chinese government is impotent to oppose the will of the people, so the Japanese government may bow to the will of the masses in order to avert an internal catastrophe through the breakdown of its industrial system.

The Japanese government is making every honorable effort to live down the mistakes of past military cabinets; it has sacrificed every advantage gained during the past ten years in order to promote international goodwill and preserve the peace of Asia. But there is a limit. That limit has been reached. The cabinet that would discuss the return of Kwantung to China would be swept out of power on a typhoon of popular indignation; the nation would rally around the militarists and once more the legions of Nippon would march banzaiing across the Yalu on the way to Peking. This is no exaggeration. The Japanese have long memories. They remember their 200,000 dead butchered in the shambles of Port Arthur, the graves scattered along the banks of the Yalu and the Sha-ho, at Mukden, Liao-yang and elsewhere in Manchuria; they recall the crushing burdens imposed upon them by this struggle for independence, and the further load in order to be prepared for the war of revenge that Russia was plotting to launch by 1912. They are now learning for the first time that their real enemy was China who invited Russia into Manchuria and handed over her territories in order that Japan might be crushed and her independence taken away. They are learning at this late date that China was the secret partner of their open enemy, directly responsible for their supreme sacrifice. When this truth strikes home at a time when China is once more conspiring to imperil their existence through a commercial war, the will of the people of Japan will assert itself in no uncertain manner. If China in her madness insists upon forcing the Kwantung issue, Japan, in self-defense, may place her full case before the world, go behind the twenty-one demands, repudiate the Portsmouth negotiations and in the light of China's confession at Washington, demand the indemnity in cash or in territory she was buncoed out of by the operation of secret diplomacy.

Owing to the profound secrecy surrounding her partnership with Russia, China escaped the penalty which all nations have paid for defeat in war. China even had her full sovereignty restored over the three eastern provinces which Russia had determined to annex, or as Kuropatkin tersely put it: "We will turn Manchuria into another Bokhara," that is to say, closed to foreign trade and residence, a walled-in Russian preserve. China, however, emerged from the conflict a victor, while the real victor, bled white in the struggle, was forced to remain content with a short time lease to a worthless piece of property and the ownership of a busted, broken down railway. Seventeen years later, China frankly confesses and files a summary of her secret alliance with Russia, providing the evidence that she had lived up to her end of the bargain by ceding territories that enabled Russia to get into a position where she could more readily annihilate Japan.

After silently chuckling over the fact that no one paid any attention to her confession of guilt and relying on American sentiment to support and protect her, she now says to Japan," get out of Kwantung; restore to me full sovereignty over the territory you stole from me in 1915 or I will proclaim a boycott against your goods and starve you out." China honestly believes that she has the world buffaloed, and can frighten Japan into cancelling the Manchurian treaty. She overlooks the fact that if one treaty can be so lightly repudiated, other treaties can be similarly vitiated, so in resorting to these tactics, she simply invites Japan to follow her

THE JOKER IN JAPAN'S HAND

China's Confession of Guilt

A Forgotten Document that May Overturn the Washington Treaties, Re-open the Portsmouth Negotiations and Change the Map of Eastern Asia.

Official Text of the Secret Treaty of Alliance between China and Russia, Signed in May, 1896.

Summary Filed by the Chinese Delegation at the Washington Conference.

"Article 1.—The high contracting parties engage to support each other reciprocally by all their land and sea forces in case of any aggression directed by Japan against Russian territory in Eastern Asia, China and Korea.

"Article 2.—No treaty of peace with an adverse party can be concluded by either of them without the consent of the other.

"Article 3.—During military operations all Chinese ports shall be open to Russian vessels.

"Article 4.—The Chinese government consents to the construction of a railway across the province of Amur and Kirin in the direction of Vladivostock. The construction and exploitation of this railway shall be accorded to the Russo-Chinese Bank. The contract shall be concluded between the Chinese minister at St. Petersburg and the Russo-Chinese Bank.

"Article 5.—In time of war Russia shall have free use of the railway for the transport and provisioning of her troops. In time of peace Russia shall have the same right for the transit of her troops and provisions.

"Article 6.—The present treaty shall come into force from the day on which the contract stipulated in Article 4 shall have been confirmed. It shall have force for fifteen years."

Has Japan the Right to Demand an Indemnity from the Secret Ally and Enemy who Concealed her Responsibility for the Russo-Japanese War and Emerged as the Innocent Victim? In 1905, at Portsmouth, Japan was Buncoed out of a Cash Indemnity: In the Light of China's Confession of Guilt Can She now Demand Reparation in Full?

lead and reopen the Portsmouth negotiations and demand full reparations for her losses in the war of 1904. There are no statutes of limitations in such matters.

Germany was called upon to pay reparations to the full extent of the allied losses, and when it became apparent that she had no intention of complying with her pledges, France simply exercised her liberty of individual action, occupied the Ruhr and started to collect her share of the indemnity. Despite the fact that France was only one of several allies who signed the Versailles treaty, her independent action has as yet called forth no official protest from her partners. While they may not approve, they understand, and at heart sympathize with her motives.

If, in the light of China's tardy confession at Washington, and her attempt to break the 1915 treaty, Japan now decides to re-open the Portsmouth negotiations and calls upon China to pay the full costs of the Russo-Japanese war, and China refuses, will Japan be justified in occupying the whole of Manchuria until her claims are settled, or, if there is no prospect of recouping her losses from the revenues of these provinces, is she entitled to annex them as a prize of war, in the same way that Germany, Austria and Turkey were dismembered to satisfy the demands of the allies at Paris? It would seem difficult to apply one principle in one part of the world and deny its application in another part.

G. B. R.

The Consortium

A Statement of Policy

A MEETING of the council of the China consortium was held in Paris on May 28, at which were present Sir Charles Addis, R. Th. de la Chaume, Thomas W. Lamont and Kanji Yano, representing the British, French, American and Japanese groups respectively.

A discussion ensued on the proposed consolidation of China's unsecured obligations and instructions were issued to the groups' representatives at Peking to examine, in consultation with the four ministers of their respective governments, the existing floating debt of China, including all loans which are unsecured or of which the security seems likely to prove inadequate in the near future with a view to formulating in due course a comprehensive scheme of debt consolidation.

The council also had under consideration the general policy of the consortium in China, and it was decided to publish this in the form of a separate report. This timely document comes to refute the stories calculated to destroy the confidence of the Chinese in the good faith of the consortium and give strength to independent financiers in floating loans to bolster up the Peking government. It also dispels the idea prevalent amongst Chinese and certain foreign elements that the consortium can be used as the instrument to carry out any intervention in the affairs of China that might in the most remote way be construed as an impairment of her administrative independence. It bears out what we have said in another article, that foreign intervention in the affairs of China through the consortium, is only possible if the Chinese authorities request this assistance in re-establishing economic and financial equilibrium. The statement is an assurance to the Chinese that the fou. powers speaking through their official financial representatives are not in sympathy with the opinion and resolutions of their nationals in China who clamor for immediate intervention. Since this statement was issued, President Harding has expressed himself of the opinion that the only salvation of China lies in the operation of the consortium, but it is evident that this is not intended to mean that further loans to the present Peking government is advisable. It means exactly what THE FAR EASTERN REVIEW has been saying for the past year, that once a representative government is established by the Chinese themselves, a government which will be representative of all factions and into which all factions will pay their just revenues, then and only then, can the four powers step in and lend a helping hand to China by strengthening that government through the consortium. Until China is unified and there is some guarantee that the security for further loans will not be diverted into the pockets of the war-lords or independent provincial treasuries, and that they will be remitted to Peking for the service of legitimate obligations, the consortium cannot function. It is futile for the Chinese or their apologists to expect foreigners to advance millions for further administrative expenses which find their way by devious channels into maintaining huge armies.

The statement of the consortium follows:

The council of the China consortium having under review recent telegram from their representatives in Peking as well as press message and comments bearing upon the present economical and political situation in China considers that a general statement of the policy of consortium may be at this time of interest to the public.

The policy of the consortium, namely the substitution of international co-operation for international competition in the economic and financial affairs of China, has been definitely affirmed and endorsed in a large sense by China and the powers in the treaty signed at Washington on February 6, 1922.

The treaty is in effect an undertaking by the powers to respect the sovereign rights of China, to preserve her territorial integrity and to provide her with a free and unembarrassed opportunity to develop her economic resources and maintain for herself an effective and stable government.

The consortium is an appropriate instrument for giving effect to this policy. It is not designed as a permanent organization, but rather as a temporary bridge by which China may be assisted to pass in comparative safety through the difficult period of transition from an unsettled to a settled state of government.

What has already been accomplished appears to justify the belief that the consortium has been constructed on sound lines, and may reasonably be expected to fulfil the purpose for which it was designed with due regard to the natural susceptibilities of the Chinese on the one hand and the security of the foreign investor on the other.

It is popularly supposed, and occasionally asserted, that the main object of the financial groups composing the consortium is to harvest undue profits reaped from loans forced upon China under the protection of their respective governments. This is not the case. On the contrary it has been by their consistently refraining from lending that their principal success has been achieved in encouraging the utilization of native savings before recourse is had to foreign capital, and in arresting the profligate expenditure which was heading the country straight for bankruptcy. It is not too much to say that the consortium has helped to stimulate and foster a sane and independent public opinion in China, and, by putting a stop to the menace of financial penetration arising from indiscriminate and unproductive foreign borrowings, is helping to conserve the integrity of the country.

Much still remains to be done, and until their work has been accomplished the several groups of the consortium are convinced that they would not be justified in having regard merely to their own convenience by resuming their freedom of independent action. They are reinforced in this conviction by the consideration that the consortium appears to form the chief barrier between China and the policy of spheres of interest which prevailed during the last decade of the XIXth century. It will be remembered that it was during that period, known as the "Battle of the Concessions," that definite claims to exercis preferential rights over specific geographical areas of China were advanced by different powers. If these claims had been maintained the disintegration of China must have followed. Any backward step towards the resumption of a similar policy might be expected to produce similar results.

The pressure upon modern nations to discover and develop outlets for their trade is increasing, and China presents to-day by far the largest undeveloped field for commercial expansion. If the restraint at present exercised by the co-operative action of the consortium is removed, the resort to the pressure of individual agents in competition with each other would appear to be inevitable. From that it might well be but a step to the intervention of foreign governments in order to protect the vested interests acquired by their nationals in different parts of China, and spheres of interest, with consequences disastrous to China, would once more be established.

It is more in the interests of China for the powers to deal with her as a whole rather than separately, in co-operation rather than in competition with one another. It is the aim of the consortium to assist China in the building up of her credit until some day like other nations she can borrow for her requirements on the strength of her national credit, without the necessity of recourse to specific security or supervision of expenditure. When that day comes it will be time enough to talk of disbanding the consortium. Until then the consortium must remain intact and, with the approval and support of the governments, continue to perform with patience the functions assigned to it.

It is the settled policy of the consortium to refrain from interference in the internal political affairs of China. The present political upheaval in that country precludes the immediate hope of giving practical effect to any consortium proposals for an administrative loan. Conditions, however, change so rapidly that the groups must always stand prepared for action in anticipation of the time when China shall have again attained to such degree of political peace and security as to afford a reasonable prospect of a stable government.

Industrial Loans, in which railway loans are included, are in a different category. Provided adequate security can be obtained there seems to be no reason why the further development of railway communication in China, in itself a potent means of political unification, should wait upon the solution of her administrative problem.

It is recognized that an essential part of any scheme for the financial reorganization of China is the consolidation of the floating debt and a scheme for such consolidation is at present under consideration by group representatives in Peking.

A certain portion of the Chinese public appears to be under the delusion that in some way or other the object of the consortium is to obtain control of China's finances and railways. If such a delusion really exists, it can only be due to a mistaken reading of every public announcement whch has been made on the part of the groups.

It has repeatedly been stated that interference with the domestic politics of China has no part in the program of the consortium, that the reorganization of China's finances must come from China herself, and that the rôle of the consortium is limited to an endeavor to assist the Chinese authorities, if requested to do so, in re-establishing economic and financial equilibrium.

It would be futile to ask the foreign investor, to whom the consortium stands in the relation of quasi-trustee, to subscribe to a Chinese loan until he is satisfied that its proceeds will be properly expended and his capital duly returned to him at maturity. It is indisputable that this necessitates some measure of supervision, but no more control than the minimum actually required to provide the adequate degree of security without which it would be impossible to issue a foreign loan.

It is the policy of the consortium to assist in building up the general credit of China on such secure foundations that all outside intervention may be gradually eliminated and the entire control of loan service and expenditure may finally pass into the hands of China herself.

There appears to be some misunderstanding in China with regard to the suggestion that the land tax might at some future date be utilized as a source of security for a supplementary administrative loan should the other revenues of the country prove insufficient for that purpose, or be already fully pledged. That the collection of land tax should be remodelled on the lines of that of the maritime customs, *i.e.*, placed under foreign supervision, formed no part of the suggestion, and was not even discussed. Neither the application of foreign control to the collection of land tax, nor specific hypothecation of that security, came within the scope of the conclusions reached at the consortium conference at New York in October, 1920. The project of a loan secured on the land tax was not then and is not now under consideration by the consortium.

No Loans to China

American Financiers Advocate a Square Deal for Japan

FOLLOWING on the heels of the consortium statement, the advisory committee of the Far Eastern division of the U. S. department of commerce appointed to report on how the Chinese government could be helped financially at this time submitted its recommendations at a luncheon meeting held at the lawyer's club in New York on June 8. It will be recalled that this business-men's committee was appointed some months ago to investigate and co-ordinate the debts owed by the Chinese government to American concerns and co-operate with the government in Chinese trade matters. The members of the committee are E. Stanley Glines (Chairman), of Lam, Glines & Co., Chas. M. Muchnic, vice president of the American Locomotive Sales Corporation, M. A. Oudin, vice-president of the International General Electric Company, A. I. Eisberg, of the San Francisco chamber of commerce, and Frank Waterhouse of Seattle. The meeting was attended by representatives of the most important American concerns interested in China.

In answer to the request of the Far Eastern division, Mr. Glines indicated that the best way out, both for China and her creditors, seemed to lie in an extension of the $180,000,000 obligations on which China was in default. His recommendations, as well as those of the consortium, undoubtedly influenced President Harding to declare in favor of the consortium as the best instrument for saving China, and comes as a distinct rebuke to the group of little-Americans who have consistently criticized and condemned the sane policy of Mr. F. W. Stevens (representative of the American group in Peking), in declining to be rushed into lending large sums to China without adequate security or supervision over their expenditures. To those creditors seeking to shift their load to the pockets of the bondholders such action was most distasteful. This group insists that our financial representative at Peking be a man with imagination and power to act "a man of the Hoover type with large experience in international finance and industrial achievement."

Mr. Glines, speaking for his committee of hard-boiled business men, starts right out with a positive statement, a knockout for the quick action positivists in China. He says:

"It is my opinion that the Chinese government has no acceptable security which could be offered for a new loan at this time.

"Those of us who have large interests in China, or who might be attracted to this field in a large way, are confronted with two lines of thought. First, do we desire to see our government become more deeply involved in China as a government in the protection of such interests as we now have or might have? This might be in co-operation with other governments or independently; and is this a support upon which we could rely? Or, would we like to see less foreign interference, leaving the Chinese to themselves to work out their own salvation?

"Should the foreign holders of the overdue obligations of the Chinese government railways exercise their rights and take over these lines, our government would be inevitably involved and tremendous pressure would be brought to bear to protect American interests. This would virtually result in the Americans and Japanese taking over the Pekin Suiyan; the British the Tientsin-Pukow and Pekin-Mukden; the Chinese bankers, in co-operation with the Japanese, the Pekin-Hankow, etc.

"In the event of the French ratifying the 'Nine Power Chinese Customs Treaty' I would recommend that this be funded for the purpose of taking up overdue foreign obligations, including those of the ministry of communications. No new money would be involved; securities could be issued in exchange for outstanding obligations. This would relieve the government of foreign pressure, their governmental income would then depend upon their efficiency in operating their utilities, and since the internal native loans would have to look to this entirely, there would be considerable pressure brought to bear by the Chinese for a government that could function as a government, which might lead to the Chinese creditors taking over the roads and operating them in effect as private utilities.

"In the event of the funding of this 2½ per cent. customs increase becoming a reality, another source of income to the government and native creditors would be to follow a plan put forward by Mr. Eldridge, chief of the Far Eastern division of the department of commerce, and that is the organization of the wine and tobacco tax functioning like the salt gabelle with foreign supervision at the scource, if desirable, and the imposition of internal revenue taxes, under foreign control if desirable, at the place of manufacture and entry.

"Of the total amount owed abroad by the Chinese government, 40 per cent. represents overdue obligations to Japanese business interests and about 5 per cent. represents obligations owed to American business interests.

"At the recent disarmament conference held in Washington it was suggested that the Chinese government be permitted to increase its customs duties 2½ per cent. This would yield annually about $20,000,000, which would take care of the interest on the overdue obligations and provide for the creation of a sinking fund. This was known as 'The Nine Powers Customs Treaty,' and all the nations party to it have ratified the agreement with the exception of France. It was provided that three months after the nine nations had signed the treaty a conference would be held in Peking.

"It is to be remembered, however, that China is in political chaos, and that the lives and property of all foreigners are in danger. We all want to see a stable and prosperous China run by the Chinese; the question is how to bring this about, whether by steps that might lead to wholesale foreign intervention or by leaving the Chinese measurably to themselves to work out their own solution. Unfortunately, a middle ground at this time seems very difficult.

"All business interests are in agreement that a first-class business man like Eliot Wadsworth or W. D. Gibson of the treasury department, Cameron Forbes or Frederick W. Stevens should be appointed as one of the American members of the special conference on increase in Chinese customs duties to meet in Peking within three months after ratification by the French of the 'Nine Powers Customs Treaty.' We are all very much afraid that it will be a political appointment, which would be disastrous to American business interests in China."

It will be seen from this report that the American advisory committee working in conjunction with the department of commerce had the vision to include in its list of loans to be repaid, $72,000,000 gold (Y.144,000,000) owed by China to Japan, and which covers the more reputable of the so-called Nishihara loans. As some of the American loans are in the same unsecured category and advanced for no specific purpose, it was natural that any consolidation scheme must include these much criticized transactions. Later telegrams from Washington would seem to indicate that the state department working in close harmony with the consortium failed to approve the plan for the proposed consolidation loan of $180,000,000 gold recommended by the advisory committee and the department of commerce. Secretary Hughes stands firmly upon the consortium platform that because of the chaos in China the time

is not opportune to lend any money to her and expressed the opinion that the American government should confine its fiscal relations with China to the protection of American investments in this country. This disposes for the time being of the constant agitation to induce Americans to open their purse strings and bolster up a government which does not exist.

More Loans to China

Independent British Attitude Freezes out Japan

QUITE different from the American position and unqualified endorsement of the consortium policy is the attitude of those independent British investors who subscribed to the unsecured "Vickers" and "Marconi" loans to the Chinese government, now in default. The position of this group is similar to that of the group which desires immediate action of any kind in order to satisfy its claims on Peking. The prospects of the British independent investors under the leadership of Mr. Birch Crisp are decidedly unpleasant owing to the opposition of the consortium to any allocation of the surplus salt revenues for the service of the above loans. As these two loans were issued prior to the organization of the new consortium at a time when the old combination had practically ceased to function and received the approval of the British government, there is an increasing tendency to question the right of the new consortium to take over the assets and rights of the old combination which negotiated the reorganization loan of 1913 secured on the salt revenues.

It will be recalled that President Wilson withdrew support to the American group because of the terms of this loan which seemed to impair the administrative independence of the Chinese government. This resulted in the withdrawal of the American group from the old six-power consortium, which then proceeded to issue the loan for £25,000,000 secured on the salt revenues and gave the issuing the banks an exclusive lien on these revenues for the security of future loans. When the new consortium was founded in 1920 under the leadership of the American group at the invitation of the American government, the Americans became an equal partner with the others in their assets, thus participating in the very deal which President Wilson refused to sanction in 1913. Naturally, if at this time, the independents can challenge the validity of the claim of the new consortium to be the successor to the old pre-war combination, it places the Americans outside the group which controls the salt revenues as security for further loans; a most delicate position.

As most of the opposition to any loan to Peking pending unification arises from the American group, the independent operators who issued the "Vickers" and Marconi" loans can be expected to use every argument which may assist in forcing the consortium to surrender its exclusive option on the only available surplus in sight.

The feeling in England on this matter is running very high and may be summed up in the following extract from "Time and Tide":

"When unfortunate investors subscribed for these Chinese notes and bills the old consortium was dead and the new one had not seen the light of day, and apparently the new one is not greatly interested in what has happened in the intervening time. . . . In some parts of the city there is a tendency to suggest that the holders of these investments subscribed to them with their eyes wide open and the high rate of interest, namely 8 per cent., was sufficient warning that the securities were highly speculative. The reply to this is direct and simple. They were: (*a*) A direct obligation of the Chinese government; and (*b*) the India office in 1921 were offering 7 per cent. for an Indian government loan. If we have come to such a pass in international affairs that the simple promise of the nation to pay cannot be relied upon and specific security must be pledged before loans can be made, then we are paving the road to suspicion and chaos."

At a meeting of holders of the defaulted Chinese government eight per cent. sterling treasury bills and notes held in London on May 29, Mr. C. Birch Crisp explained the situation surrounding the new loan negotiations. Mr. Crisp said that the British bank for foreign trade acting in conjunction with his firm, negotiated the sale in October, 1918, of £600,000 of Chinese government eight per cent. ten-year sterling bills. Vickers notes amounted to £1,803,-200, and were issued in October; 1919. The default on the Marconi notes was on the August coupon in 1921, and on the Vickers notes in October, 1922. In America there had been issued notes to the value of about $10,000,000, so that there were in default securities similar in character of the nominal value of about £5,000,000. His connection with a loan issue for the Chinese government in 1912 had no bearing on the position in which they now found themselves; because these treasury notes, issued in 1918, came into existence in connection with the erection of wireless stations in China which the British government desired to be erected, and when the Marconi Company took payment from the Chinese in these treasury notes the British government facilitated the whole of the negotiations and approved of the issue of the notes upon the market. The same thing applied to the Vickers notes.

In February, 1921, the British bank for foreign trade was asked by the Chinese to advance the amount of the coupon then due for payment. The bank did advance that amount, and then asked the Chinese to secure the bank for that payment and to secure the noteholders their future payments. The Chinese, let it be said to their credit, were very desirous of keeping faith with the investor, and pointed out that there was a surplus of revenue arising out of the salt gabelle, and they were willing to inscribe an amount upon that revenue which would have prevented default. When the Chinese notified their readiness to inscribe the notes upon the salt gabelle they asked the British government to facilitate the process, and that they appeared ready to do, but the 1920 consortium, composed of some bankers and finance houses of Japan, France, the United States and Great Britain, lodged a protest with the Peking legation and claimed that to inscribe those notes on the surplus salt gabelle revenue would be an infringement of their rights. Personally, he failed to see how they could substantiate such a claim..

Proceeding, he said said that in March of last year he went to New York to examine the situation there.

One result of his visit was an intention on the part of certain parties there and here to re-open negotiations with the Chinese government, and at this moment they contemplated a transaction which would have the effect of securing these notes upon the surplus customs revenues.. The discussions between Peking and London had gone on now for well over six months, and his group had notified the Chinese government that, if a contract be made, that contract must first be sanctioned by the Chinese parliament. The consortium was vigorously opposing the completion of the contract with them.

He did not for one moment suggest that the English bankers forming part of the consortium would do anything to prevent their getting security for the notes. It was on record that they did portest against the salt gabelle being utilized for the purpose, and he thought it behoved them all to discover what would be the attitude of the consortium supposing they made a contract with the Chinese government for a new loan—if they were prepared, as he had been, to say to the Chinese. "No new loan can be issued until the default upon these notes has been rectified."

Commenting on this meeting, *The Financial News* says "apparently the 1920 consortium is a dead sort of thing, for it has not yet functioned. It is not working with the Chinese government, and yet blocks the way to a settlement of the 'Marconi' and 'Vickers' claims and to the raising of a further loan. Deferring payment is not necessarily default; it all depends upon tenure of life. If the Chinese government would only throw off its lethargy and assert its authority there should be no difficulty in solving loan problems. At the same time, while the Chinese profess their willingness to pay their debts, we imagine they are not crying to do so."

In summing up the British position it would seem that the group led by Mr. Birch Crisp is simply seeking to supplant the consortium and take over the only tangible security for a new consolidation loan to the amount of £20,000,000, in order to protect noteholders in America and Great Britain, with no reference to

the defaulted Japanese obligations of the Chinese government. The independent operators censure the consortium because it does nothing to help China or the holders of defaulted securities and challenges its right to take over the assets of the defunct organization. Mr. Crisp now offers to negotiate a new loan on condition that noteholders in England and in America are protected. In order to effect these two operations it is proposed to create new bonds to a nominal value of £10 millions, bearing 8 per cent. interest and redeemable over the 30 years beginning 1928. The notes would be exchanged at par for these bonds on conditions that the holders underwrote an equal nominal value of the bonds, which would be issued to the public at 97½ per cent. This scheme met with the approval of the noteholders at the May 29 meeting, the more so that the payment of arrears of interest is provided for. The Peking government, it is understood, has also agreed to the terms, but the consortium has control of the funds necessary to secure the services of the new loan. There the matter rests for the moment, or until the new committee secures, if possible, the co-operation of the consortium in permitting the salt surplus to be diverted for this purpose. As pointed out, there is apparently no provision made in this independent British scheme to protect the unsecured Japanese investors, and it is hardly likely that the consortium will at this late date consent to any impairment of the security that the Japanese group has an equal right to enjoy for the liquidation of its defaulted notes. The recommendation of the American advisory committee which included these Japanese loans in its consolidation scheme, is in somewhat striking contrast to the Crisp proposition.

A Resolution and Brass Tacks

The American chamber of commerce of Shanghai and the American association of China on June 13 sent to the secretary of state of the United States a cablegram containing the following recommendations:—

1—Suspension of all benefits accruing to China under the Washington conference.
2—Disarmament and return to their homes of China's 1,200,000 surplus troops.
3—Chinese government finances should be placed under foreign supervision.
4—Foreign guards should be placed upon all lines of communication both land and water.
5—Foreign garrisons should be placed at strategic points throughout China.
6—All further remission of the Boxer indemnity should be stopped.
7—Full co-operation with Great Britain in providing remedies for present conditions in China.

THE above resolutions reflect the opinion of an important section of American and British interests in China. They do not represent the opinion of all commercial interests nor do they represent the most mature thought of foreigners in China on the question of intervention. They are, however, important as the immediate reaction of foreigners to the Lincheng outrage and to the accumulation of outrages in China since the Paris conference.

They are still more important as showing how far the opinion of the Shanghai American chamber of commerce has changed towards China since 1919, when its secretary was sending circular letters to firms at home urging them to bring pressure to bear on their congressmen and senators to demand from the state department all the confidential reports about Japan's activities in China and to read them into the congressional record. The Tientsin American chamber of commerce also sent similar circular letters to firms at home in order to arouse them against the continued Japanese occupation of Shantung, declaring that armed force alone could drive them out, in effect, an appeal for American military intervention.

In less than four short years, we find the same American chamber of commerce, led by the same group, advocating a complete reversal of policy, even to the suspension of all benefits accruing to China under the Washington conference. The literal application of this resolution would carry with it the restoration of Tsingtao, the Shantung railway and mines to Japan, the return of Japanese troops for policing Shantung, and recognition of such of the twenty-one demands as were surrendered at Washington by Japan. If the benefits accruing to China as a result of the Washington conference are suspended, it means *all* of the benefits, not some of them. The other signatories to the pacts could not very well suspend their share of the benefits and insist that Japan alone be penalized, so the resolution means that the American chamber of commerce now advocates Japan's retention of her special advantages. This must be most gratifying to President Harding, Secretary Hughes, Elihu Root, Senator Lodge and other highly placed Americans who accepted at their face value the recommendations of Americans in China as to the policy they should pursue.

Taken in connection with the other six resolutions, we find the American chamber declaring that the Chinese government is now unworthy of American sympathy, that America should adopt a policy which would be more drastic and far-reaching in its effects than that which Japan advocated and which these same gentlemen condemned at the time of the twenty-one demands and were even willing to fight Japan over. Japan never advocated foreign garrisons throughout the interior. Japan never advocated seizing control of China's finances, despite the fact that China owes more money to Japan and has defaulted on more Japanese loans than she owes to other nations. Japan never advocated enormous navies on the great waterways of China. Japan never proposed to destroy completely the right of the Chinese people to find a way out of their troubled, not even in the irritating Group V. These things and more are being advocated by the same gentlemen who knowingly, or otherwise, worked hand in glove with the clique who labored to plunge America into war with Japan to save China from the application of the twenty-one demands. These things are being advocated by the same gentlemen who attacked this magazine and its editor because he could not agree to the destruction of American trade and prestige in China by the silly, coddling attitude of these same Americans during the period from 1918 to date.

Such drastic resolutions must convey to the heads of the nation at Washington how unwise it is to formulate national policies on the snap judgement of any one group and must vividly remind President Harding and Secretary Hughes that they have "lost face" because of having listened to the advice of the identical group which now calls so loudly for a reversal of policy. Experience therefore teaches them to carefully scrutinize all political resolutions and recommendations passed by Americans in China in order to determine just how far they really represent national opinion. In this case, where an appeal is made in the name of the American community as a whole for the reversal of a policy strongly advocated up to a very few months ago, and urges Anglo-American co-operation in armed intervention in China, it is of vital importance to the American government to know exactly what lies behind such a move. It goes without saying that had the American community organized itself for such an expression of opinion and the above resolutions put to a vote before a committee of the whole, they would have been voted down and others more carefully worded passed. Such a general meeting would have disclosed that the American community as a whole is opposed to intervention of any type in spite of conditions in China and in spite of the views of a small minority.

American initiative in passing such resolutions is to be condemned. Whoever drafted, passed and paid for their transmission took upon themselves responsibility for a move which singles out American interests for retaliation in the shape of commercial boycotts and other practices dear to the heart of the Celestial.

One of the greatest obstacles confronting united action on the part of the powers in bringing pressure to bear upon China is the unwillingness of any diplomat to take the initiative that invites the certain commercial retaliation of the Chinese on his own nation.

It is very unwise for a commercial association in China to ignore its consul-general and minister in communicating with its home government. It is sheer impertinence when such communications attempt to instruct their governments, and it is to be expected that all such communications will be referred back immediately to the consul-general and legation for investigation and comment. These fundamental rules of etiquette and procedure have long since been relegated to the scrap heap by American associations in China who, at the slightest provocation, attempt to dictate to Washington what to do and how to do it. For some years these peculiar duties of the diplomatic and consular service have been usurped by the group which directs the moulding of American policies in China and which transmits its recommendations for war with Japan or intervention in China as the case may be, direct to the secretary of state and the American press. It makes good copy for the newspapers and brings considerable publicity to the policy-makers. At the same time, it relieves the legation and consulates of much responsibility permiting them to attend to ordinary routine matters. Under, these conditions, the American government will soon be able to further reduce its overhead by eliminating its diplomatic representation in China and confiding its delicate negotiations to a student interpreter or fourth rate civil service clerk.

It is safe to say that the various foreign powers are kept fully and accurately informed by daily telegraphic reports from the legations of every development in China, in addition to those of the military, naval and commercial attaches. They are also kept informed of every public meeting and the trend of opinion expressed through resolutions, editorial opinion or private comment. Part of the duties of the accredited diplomatic representatives of the various powers is to act in an advisory capacity, and there is no justification for ignoring their existence except when it becomes apparent that they are incompetent or willfully neglecting their duties. When American commercial organizations ignore the presence of their official representative and transmit instructions to Washington over his head, their official representative becomes an ornament, he loses face, and the responsibility for any loss of national prestige or trade falls squarely upon those who usurp his duties. Officious meddling with delicate international questions almost compromised the nation to a war with Japan. Heroic action alone on the part of the more sober-minded element at home averted this catastrophe. It may require equally heroic action to avert another catastrophe if these tactics are to be continued.

There was just one sensible way to handle the present situation. The entire foreign community, represented by all the foreign chambers of commerce, bar associations, clubs and other bodies, should have assembled and each body passed the resolution simultaneously. Leadership in such a delicate matter should never have been accepted by the nationals of any country. As it is, it compromises Americans to exclusive co-operation with the British and ignores other equally important interests. Anglo-American intervention without the participation of Japan is not only impractical but highly prejudicial to peace and good understanding. Unless Japan is requested from the first to co-operate on an equal footing with the others and share all responsibilities, the road is paved for independent Japanese intervention with demands for indemnities quite apart from what the other powers may consider equitable. It must not be overlooked that Japan has her own grievances against China and may be forced to take independent action unless China shows some disposition to mend her ways.

The Americans who drafted the above set of resolutions have shown themselves as ignorant of their own countrymen and the policies of their government as the group who labored so hard to have America challenge Japan to "save China." They do not know that the people of America have very set ideas against intervening in the internal affairs of another country. It would surprise them to learn that firm adherance to this doctrine saved their own country from European intervention during the civil war, when Lincoln, exasperated at repeated overtures the part of peace-makers, informed the British government that any further note to bring about peace, would be considered as an unfriendly act. We insisted upon our right to solve our problems in our own way, and so created a precedent in international law that has become the basis of our attitude towards other countries placed in a similar position.

It was this principle which guided our policy with Mexico at a time when over 700 American men and women were massacred and our soil violated by the raiders of Villa. It is hardly to be expected that our government will depart from this principle in order to intervene in China, especially when at least one-half of our nationals in this country are engaged in philanthrophic pursuits which would be ruined by the adoption of a firm policy. Under these conditions, it is folly to think that the people of the United States will ever consent to the dispatch of a large force to police China. Americans will never again go crusading over the seas to make the world safe for democracy or sacrifice themselves for any other old shibboleth. If Americans ever intervene in China it will come only when the lives of all foreigners are actually in danger and then in co-operation with other powers.

As to the British, they retain the spirit, but the day is past when they can continue single-handed to regulate the affairs of the world. Great Britain has reached the limit of her endurance. In any plan of international intervention in China she can be depended to assume her share of the burden by contributing a nominal contingent of troops for police duty with a squadron for their support. It is safe to say that her participation would not exceed five or six thousand men or about the same number as might be released by the Americans from garrison duty in the Philippines for the same service. These are the realities of the situation overlooked in drafting the above resolutions, and which should have been considered and discussed before a general assembly of Americans, or even a committee representative of the really important national interests operating in China. As it is, many important American firms oppose the resolutions for the reason that they are really not beneficial to China and in no way reflect their opinion. These interests, with wide ramifications throughout the interior, feel that the resolutions will result in inflaming the minds of the Chinese against Americans and injure their business, all of which might have been avoided had they been worded differently and brought before a committee of the whole for discussion.

The truth of the matter is that no meeting of the entire chamber was held to discuss a matter of such tremendous importance, although general meetings have been held in the past to discuss matters of much lesser importance. The resolutions were drafted and passed by a sub-committee of five members in which men of training and experience in these matters were conspicuous by their absence. These facts simply mean that the resolutions do not represent American opinion but the opinion of the individuals who wrote them. This systematic ignoring of other Americans in passing important resolutions by a committee without bringing the matter up for discussion at a general meeting is working considerable harm to American interests. It was only last month that we commented on a similar incident in the matter of the protests against the National City loan to the Oriental Development Company, passed without any opportunity for the representatives of the National City Bank to say a word in explanation, yet its subsidiary, the International Bank, is a member of the chamber, and the recognized financial instrument of our government.

As to the resolutions themselves, much can be said in their favor, but they went too far and compromised the American community to a line of action completely out of harmony with our traditional attitude towards China, and which if acted upon, would have resulted in a complete breakdown of our prestige. The efforts to provoke American intervention either independently or in co-operation with Great Britain, arises from the ungrounded fear that Japan, on her own initiative, may act to protect her own interests and gain an ascendency in the affairs of China that might prove inimical to other nations. This attitude is simply a reflex of the discredited program to bring about Anglo-American domination of China through Wu Pei-fu and his henchmen characterizing western diplomacy at Peking for the past three years. The sooner this idea is relegated to the ash-heap the better it will be for all.

There has been altogether too much intervention in the affairs of China by supporting one faction against another and encouraging the Chinese to oppose Japan by raising false hopes of foreign assistance in the event of a show-down. It is entirely possible that unless the Chinese set their house in order and refrain from further outrages and indignities upon foreign lives, and meet their just obligations, that some sort of intervention may be necessary. Intervention of any kind that meets with the open or passive resistance of the Chinese people will require far more troops to guard the railways and supervise the collection of the salt revenues

than either Great Britain or America would care to send for such purposes. Unless the Chinese of their own initiative ask the friendly assistance of the foreign powers to straighten out their finances and generally reorganize their government, any departure from the rules of international procedure by armed intervention may lead to an adventure that the western nations are in no condition to carry out to its logical end. It is easy enough to start something but extremely difficult to finish it, unless the Chinese themselves are plainly in favor of outside tutelage.

Intervention of any kind means the complete negation of the nine-power treaty, an impairment of China's sovereign and administrative rights that would stand as an everlasting monument to sentimental diplomacy. It is hardly conceivable that the present American administration will take any action that might be construed as evidence of its gullibility or that might be employed by political opponents as an argument against the efficacy of the Washington conference. The political parties in America are lining up for the next presidential campaign and it is safe to predict that the mahouts of the republican pachyderm will provide a front seat in the howdah for those who put through the Washington treaties. Americans in China may shout their heads off, but it won't stop the procession. Harding will fall back on the Wilsonian policy towards Mexico and watchfully await developments, praying and hoping that our sister republicans will see the error of their ways and come to their senses before next July.

It was a foregone conclusion that intelligent Chinese would view with disfavor any movement to deprive them of the benefits arising from the Washington conference and would come together as one man to oppose foreign intervention. When the American association and American chamber of commerce declared that the joint resolutions were endorsed by Chinese bankers and merchants, it was not surprising that the Chinese bankers' association and the Chinese chamber of commerce immediately protested the statement in the following terms:—

"We take the liberty to say that owing to the continuous fight for rights and privileges of those high officials in the central government without taking any care of the general welfare, our citizens might warn the government in such a way was to awake them in the sense stated, while foreigners might be misled to think that our citizens are of the same opinions with them. It should be understood that the Chinese banking groups here are functioning in no other matters than pecuniary ones and never attempting to make any senseless suggestions to communities whatsoever. In case insistance is laid on the recommendations which will no doubt effect our rights and privileges given by the Washington conference, we, Chinese citizens, will certainly protest against the violence and seek a way for protection."

Following this plain statement, the various guilds joined in a letter to the Chinese chamber stating that none of them had been consulted before the passage of the resolutions, while prominent political leaders frankly declared that they would meet with serious opposition on the part of educated Chinese. This united Chinese stand taken in connection with the general unfavorable American comment, is ample evidence of how much harm may be done American interests and prestige by failure to discuss such important measures at a general meeting where wiser and older heads could have lent a stabilizing influence to the proceedings.

Within ten days after the publication of the American resolutions the Chinese chamber of commerce in Shanghai unanimously repudiated the authority of the Peking government. This step and the protest against the American resolutions indicate that although the Chinese are indulging in a good, old-fashioned family scrap, it is not a free for all affair. This declaration of independence may or may not have any meaning further than a warning to outsiders that the Chinese prefer to settle their problems in their own way, and if the American resolutions contributed to spurring the mercantile element to do something to stave off foreign intervention, perhaps it was all for the best.

The only road to stability in China is the organization of a representative government with which the powers can deal. Such government must be truly representative of the whole nation, a compromise effected by concessions on all sides. It must not be a government dominated by one military overlord whose authority has been consolidated by the force of arms. To hold that authority the victorious *tuchun* must occupy the provinces with his own trusted troops, a reversal to the Manchu system of preserving their power. It means the maintenance of such a huge army that no scheme of reconstruction based on disbandment could be carried out; no financial program a success.

When the Chinese have compromised their differences and settled on a representative government which all the provinces will acknowledge and support with legitimate revenues, it will not be difficult to find a way for the consortium to function and assist the Chinese to develop their many resources, and pay their debts. The real problem is to find some way to bring about this unification. If the various Chinese factions were fighting for some ideal, principle of government or provincial rights, no outside influences would be warranted in meddling in their affairs.

As the struggle is simply one for power, the time may well come when foreign governments will be justified in serving notice upon China to settle her internal differences forthwith and comply with her treaty obligations, or be haled before the league of nations for such punishment as this body may mete out.

G. B. R.

The Pacific Rat Trap

Forcing Japan Into a Corner: America's Duty in the Philippines

WAS the Washington conference worth while? When we read of the plans for the establishment of a huge naval base at Singapore to defend the British dominions in Asia against the ally whose fleet for the past twenty years guaranteed them from attack by a third power, and realize that the price Americans must pay for the cancellation of this purely Asiatic alliance is an Anglo-American *entente* for the defence of mutual interests in this part of the world, it begins to look as though we had exchanged one pact in order to assure peace in the Pacific for an understanding which may land us with both feet into the very thing we hoped to side-step. There exist excellent strategical reasons why Singapore should be converted into another Gibraltar, but we cannot but deplore the lack of vision which sooner or later must convince Japan that her right to exist is being challenged.

In permitting ourselves to be hypnotized into demanding the cancellation of the Anglo-Japanese pact, Americans have been jockeyed into the position of taking Japan's place as a guarantor of British supremacy in Asia. For, after all is said in favor of the formidable Singapore base, it is admittedly aimed against a possible rupture with Japan, and when the statements of responsible British writers are taken into consideration, it implies that with the aid of America she is to be isolated, hemmed in and slowly strangled to death. This is not an exaggerated statement but the logical deduction to any impartial study of the present trend of Asiatic politics. It is difficult perhaps for writers in England and America to visualize the ramifications of the present situation or understand all the difficulties confronting Japan in working out her destiny along peaceful lines. Could they but view these problems from the standpoint of a people blocked on all sides in their struggle for existence, a little more sympathy might be shown in discussing and proposing remedies that will hasten a peaceful solution.

The Singapore base is designed for the legitimate purpose of guarding the eastern gateway to India. There is much to be said in favor of this move. It is also intended to act as a barrier to Japan's expansion southwards and when we read the statements of Mr. Herbert Sidebottom in *The Sunday Times* and of Commander Bellairs in the House of Commons to the effect that the base will be of benefit to America in case of a war with Japan in defence of China or for the protection of the Philippines, we come to the conclusion that the great lesson of the world war has been forgotten. Japan's crying need for an outlet for her surplus population and guarantees for a free access to raw materials and food products, in addition to her peculiar strategic problem in Manchuria, constitutes the greatest problem the world is now called upon to solve in a peaceful manner. Unless the western powers discard the blundering diplomacy which erected a wall around Germany, the world

is headed straight for another catastrophe in Asia. Barred from America, Canada, Australia, New Zealand and British South Africa by the exclusion laws of the white man; deprived in China of the right to settle and own property by the closed door policy which prohibits foreigners from residing outside the limits of the treaty ports; persecuted by irrational boycotts; hounded out of Siberia by the Russians; denied the right of acquiring properties in the Philippines; villified and misrepresented by Chinese propagandists; harried by American protests and opposition to her development of Manchuria and faced with the necessity of keeping her children at home and providing for their existence through industrial growth, Japan already feels the tightening of the noose.

When Great Britain at this juncture establishes a formidable naval base designed to defend her Asiatic possessions against a possible attack from her old ally, and we are given to understand that her legitimate aspirations in China may precipitate a war with America in which Britain will be our ally; remembering always that Russia is slowly but surely edging her way into Mongolia in order to be in a better position to oust her from Manchuria; that China is a puppet in the hands of her enemies; it is difficult to convince the Japanese that they are not being driven into a corner where they must turn and fight for their lives.

In establishing the new base at Singapore, the British are motivated by precautionary technical considerations arising from our own vacillating policy towards the future of the Phiiippines. THE FAR EASTERN REVIEW has steadily maintained that the Philippine problem can be approached only from its strategic angle, and in the April 1921 issue of this magazine, laid down the following fundamental principles surrounding the international status of the islands, based on the inability of a Filipino republic to guarantee its neutrality in any future Pacific conflict or clash of races:

"The present centre of world empire lies in India, the cornerstone of British prestige, the bulwark of Australia, the half-way house to New Zealand, Singapore and Hongkong, the base of the mighty structure of British trade and influence in Asia and the Pacific. Before the great war, the menace to the security of this empire came from the west. Gibraltar was the key, the first powerful fortress along the all-red-route to Bombay and Brisbane. With the collapse of Germany and the elimination of all danger from this quarter for another generation, the next possible menace arises from the East. Singapore supersedes Gibraltar as the strategic key to the British empire. From a position of negligible political importance, the Philippines have become the buffer between two great empires, the barrier to the expansion of the Mongolian races to the south and southwest, the guarantee to Singapore's position and the assurance to Australia and New Zealand that they will be permitted to work out their destinies without fear of Asiatic domination. On the other hand, the islands stand as a bulwark guaranteeing to Japan that her existence will never again be menaced from that direction. The neutrality of the Philippines is therefore a matter of grave importance to Britain, Japan and Australia. Like the Swiss, the Filipino must be prepared to fly to arms at a moment's notice to defend a neutrality upon which rests his precious independence."

The subsequent Wood-Forbes report on the islands emphasized the same situation.

Since the above was written, the rubber restriction act has brought home to the British authorities the fact that their Malayan possessions (supplying three-fourths of the world's rubber output) are a most valuable asset to the empire. Aside from any consideration of its strategical importance as the "Gateway to India," Malaya demands adequate protection because of its immense intrinsic wealth. Two years ago, the Anglo Japanese alliance guaranteed these possessions against attack by any third power, relieving the British from maintaining a large Pacific fleet and naval base. With the disappearance of that guarantee at the Washington conference, Britain is now compelled to prepare against the day when her late ally may become a possible enemy. As long as the Philippines remain under American rule they provide an effective shield against any possible danger to Malaya from the north. Take away this guarantee and they become a tempting bait to any naval power seeking secret bases for submarine warfare. If Japan should acquire control of even a portion of the archipelago, British Far Eastern shipping lines and even the base and fleet at Singapore would be endangered. Should Britain get there first, the menace to Japan's existence would be even greater. If the new British undersea leviathans using steam for surface cruising be attached to the Singapore base, Japan will have sacrificed her power of defense by accepting the limitations of the Washington treaties.

These possibilities tell us that the failure of the United States to take a reasonable and definite stand on the political status of the Philippines not only stands as an obstruction to their development through outside capital, but compels neighboring nations to take every precaution for the defense of their respective colonies. The Dutch are extending their fortifications throughout the Netherlands East Indies; Britain is creating another Gibraltar at Singapore for the protection of Malaya and India, forcing Japan to strengthen her southern naval bases in Formosa. France must follow by establishing air or submarine bases in Indo-China. It may well be that the expenditure of the huge sum for strengthening Singapore is a necessary measure of military preparedness against any unfortunate difference between Japan and Great Britain: it may also be a wise move to have a near-by impregnable British base in case the United States is ever called upon to defend the Philippines. No self-respecting American, however, will applaud the sentiments expressed by Commander Bellairs and Mr. Sidebottom. We cannot conceive of a situation in which Great Britain and America acting together, or one in which America acting alone will operate against Japan in defense of China, unless Anglo-American policies and activities in this country ultimately convince Japan thas she is to be singled out for racial discrimination in other parts of the world and economically isolated in Asia. Under such conditions it is conceivable that the Japanese cornered like rats in a trap, will stand and make their last fight. All this talk about America fighting Japan in defense of China savors too much of the propaganda emanating from Peking to precipitate a show-down between the two nations. Americans do not like to feel dependent upon Great Britain for the security of the Philippines nor do we relish the idea that we may be called upon to defend China against Japan and be the catspaw for Russia or other European powers in Asia. The insinuation that America might have cause to welcome a base and ally at Singapore will be most gratifying to those Chinafied-Americans hypnotized into the delusion that it is our bounden duty to play the rôle of crusaders and defend China against Japan. It is not very flattering to American self-esteem to be again reminded even indirectly, that we are still expected to assume the burden of fighting Japan after we have compounded our differences and look forward to a long era of peace in the Pacific. The day may conceivable arise when the Philippines will have to be defended against Japan, but we are certain that it will not come while the islands remain under American rule. We incline to the belief that the far-sighted British strategists have not overlooked the possibility that within the next decade the islands may be granted their independence, in which case the British will be just as much if not more concerned over the future of the infant republic, as Japan. We prefer to believe that this is the real danger which has influenced the British to be prepared against all possibilities, and to camaflouge their motives behind the explanation that the Singapore base will be a welcome assistance to the United States in the event of a war with Japan. It stands to reason, that if America concedes independence to the Philippines, they must either defend their own neutrality and provide guarantees that none of their many islands will be alienated under lease or otherwise, or, a large American military and naval force must remain in occupation to provide these essential safeguards for the security of neighboring powers.

It is difficult to believe that the American people will consent to carry a burden, obligating them to act as the outpost of the British empire in Asia and stand the strain of the first violent clash in any unfortunate break in Anglo-Japanese relations. The British evidently entertain no illusions about our position and are preparing against the day when we will sever our connection with the Philippines.

If Great Britain proceeds with the construction of the Singapore naval base as a precautionary measure against some unfortunate misunderstanding with Japan, it is obvious that Japan will not remain inactive. We may now expect a further extension of the Japanese base at the Pescadores or some other southern Formosan port, with France taking similar measures to defend Indo-China against a possible break with Britain. These wholly unnecessary and provocative expenditures must have their influence on the American position in the Philippines. There is just as much possibility of an unfortunate break in American and Japanese relations as there is in a misunderstanding between Britain and

Japan, not to mention complications in which France may become involved in the Far East through her activities in Europe. The French labor under no illusions about the new move. They realize that as long as the present *entente* exists, Indo-China has nothing to fear. Should the slightest cloud arise, however, they forsee the loss of one of their most valuable colonies, and elimination as a political factor in China—unless they also prepare.

The cancellation of the Anglo-Japanese alliance with nothing to take its place is certainly having results, which might be avoided by a frank declaration on the part of the United States of its intention to remain in the Philippines for a fixed period of at least fifty years. The creation of a strong buffer state whose neutrality could only be violated by bringing the United States into the war, would seem so be the one move that would obviate the necessity of these huge expenditures, or, a return to an Anglo-Japanese alliance designed for the mutual protection of their Asiatic possessions against an attack by a third party.

It is folly for Americans to accept the partial British explanation that the move is simply a precaution against some unfortunate rupture with Japan. The rupture might come over rubber or oil with the United States. The establishment of the Singapore base may be the first shot in the rubber war looming ahead. France may precipitate a situation in Europe that might strain the *entente* to the breaking point or Russia precipitate a crisis through her moves in Central Asia. Bereft of the advantages of the Anglo-Japanese alliance, Britain would then require some strong guarantee that the eastern gateway to India could not be forced. There are many possibilities that come within the purview of the strategists once they start to manufacture reasons for the expenditure of funds for national protection. As long as the present tendency towards an exclusive Anglo-American working partnership exists, with Japan on the outside, there will be no lack of reasons for squandering public moneys on useless fortifications. It would seem much simpler for America and Britain to take Japan in a tripartite partnership that would do away with all these senseless preparations for future wars. At the same time, America should definitely settle for the next fifty years the status of the Philippines. Otherwise, the Washington conference goes for naught, and we can prepare for another era of fortress building that will undo the benefits arising from the limitation of naval armaments.

If the senseless provocation to Japan in the construction of the Singapore base is carried into execution and Japan becomes convinced that Anglo-American sentiment has crystallized into a tacit understanding that she is to be hemmed in on all sides, her people discriminated against and denied the right of entrance into the white man's countries; her legitimate aspirations in China thwarted by boycotts and propaganda and her existence placed in jeopardy, we must not be astonished if she takes the necessary precautions against being caught like a rat in a trap and condemned to a slow death through starvation or worse. There exists a large and influential party in Japan favoring an immediate understanding with Russia. Militaristic moves on the part of other powers based on the possibility of a break in Anglo-Japanese relations, after Japan willingly abandoned her former security and accepted in good-faith their policies for the preservation of Pacific peace, must sooner or later cause the downfall of liberalism in Japan, repudiation of the present cabinet and return of the militarists to power. In self-defense, this element will seek an understanding with the Soviet and then, the "fat will be in the fire." There is a way out of the trap set for Japan.

America is faced with a terrible responsibility. In order to assure our own safety in the Philippines, bring peace to the Pacific and guarantee the integrity of China, we destroyed the one effective safeguard for peace in Asia. It would appear that we have since aligned ourselves with Britain in a tacit understanding to oppose and block Japan's legitimate aspirations in Manchuria and other parts of China, while viewing with complacency the moves of the Soviet in Mongolia. As the coil tightens around the neck of Japan and far-sighted British strategists prepare against the day when the high-spirited Samurai will make their last fight for life, America stands by helpless, unable to move or correct its errors of diplomacy because of a sentimental and misplaced regard for the feelings of the Chinese and a wholly altruistic program for the uplift of the Filipino. In trying to avert war in the Pacific, we have created conditions, which, in the end, will precipitate hostilities in Asia.

It is time Americans awoke to a full realization of the facts. It may be true that the Singapore base is legitimately designed for the defense of Malaya in the event of an unfortunate misunderstanding with Japan: it may also be that it is only the first gun in a rubber war directed against the United States or a hint to France that her program in Europe is viewed with suspicion, but whatever is behind the move, there is one important fact that Americans dare not ignore.

Japan views with misgiving an action that infringes on the spirit of the Washington treaties. In her eyes the establishment of the Singapore base is almost a crime after she accepted in good faith a program which left her at a disadvantage of six to ten against either Great Britain or the United States. She accepted the four-power pact loyally and whole-heartedly and has faithfully complied with all the requirements of the agreement for the limitation of armaments. Japan views the Singapore base in the same manner as Americans would view the establishment of a similar stronghold in the British West Indies, at Trinidad, Barbadoes or elsewhere, which under given conditions would cut off our supply of rubber and tropical products from South America, nullify our Monroe doctrine and menace the Panama Canal. There is just as much a possibility of America attacking Guiana, Trinidad or British Honduras in order to acquire rubber lands as there is of Japan attacking Malaya, and if the Singapore base is a strategical necessity, a similar naval stronghold at Trinidad is just as essential.

Unless the British government abandons its project for the construction of the Singapore base, Japan must feel that she was duped at Washington. With Americans protesting against her development of Manchuria, accusing her of imperialistic designs after she has signed the Washington treaties; with other misguided foreigners encouraging the Chinese to apply and enforce a boycott for her refusal to surrender Kwantung; others insinuating that she is arming the bandits and inciting internal disorders in this country; still others clamoring for exclusive American intervention in the affairs of China; and with the knowledge that much of the present chaos is traceable to Anglo-American support to the anti-Japanese cabinets at Peking, it is no wonder that Japan is deeply moved by the trend of affairs, or that British writers insist that the day is not far distant when America must defend China against Japan and excuse their own preparations for defense by an appeal to our weakness. Can we blame the Japanese if they now feel that they have made concessions for peace under cover of which they are to be forced into a corner and compelled to fight for their existence?

The United States government has a duty to perform. There is little hope that Britain will abandon her plans for the Singapore base, so the only honorable amende we can make to Japan is to announce a definite Philippine policy that will guarantee their neutrality for at least fifty years. To do this, we may have to break some of our promises to the Filipinos. It is one thing or the other. If we live up to our program in the islands and concede their independence we must be prepared at all times to guard their neutrality by force of arms or witness their gradual absorption into British or Japanese spheres of influence preparatory to their partition and annexation by the strongest power. In any event, if the islands are to be developed and made self-supporting and strong enough to defend their own independence our entire Philippine policy must undergo a radical transformation. These are stern facts from whose logic there is no escape.

* * *

There are other angles to the Singapore naval base which have a special interest for Americans and although some of them can be treated lightly, others compel attention. It is well to bear in mind that the present day descendents of the Malay ocean rovers who once held sway over the isles and waters of the southern seas have their own peculiar traditions and aspirations. The Filipinos, in anticipation of their independence, claim sovereignty over British North Borneo, partly held under lease from the Sultan of Sulu. After having prevailed upon the Americans to set them adrift, they will repeat the same publicity campaign to induce the British government to pack up and get out of Borneo, in which case, if the nice, benevolent parties sitting in London decline to be moved by sentimental appeals, the Japanese menace to Singapore will be overshadowed by the still graver peril of an outraged Malaya seeking the restoration of its Borneo Alsace-Lorraine. This grave possibility must cause the British strategists considerable concern and will justify expenditures for the establishment of sub-naval bases at Labuan, Jesselton, Sandakan and other points, in order

to be thoroughly prepared against the Pan-Malay movement. When seeking excuses for the establishment of the Singapore base, the British strategists might as well include this : it is just as convincing as the arguments already given publicity.

However, it is safer for Americans interested in the development of the Philippines to stick to the rubber viewpoint. The fight for oil is not over by a long shot and in the meantime Great Britain has scored the initial victory in the rubber war. American manufacturers must willy-nilly pay tribute for several years to British foresight and to an amount that may well balance that which they are indebted to us for war advances. This is an intolerable situation after we had looked forward to post-bellum world supremacy in the control of raw products for our manufacturers. However, the cold, hard facts of the situation are before us, with our government desperately trying to remedy it by appropriating the sum of $500,000 for the purpose of investigating rubber possibilities in the Philippines and South America. In any event, we cannot escape being mulcted or discriminated against for several years, or the time necessary for new rubber plantations to obtain their full growth for tapping. It will probably be another two or three years before anything definite comes of the rubber investigation or before legislation is enacted that will enable American manufacturers to free themselves from the British monopoly.

It would seem at first glance that the Philippines would appeal strongly to Americans as a rubber producing centre, but this means throwing overboard old policies and the enactment of new legislation that must revolutionize prevailing ideas about the future status of the islands. There appear to be two absolutely essential conditions to the success of a profitable rubber industry in the Philippines. First, the bars must be let down to Chinese contract labor. The Filipino may be an excellent workman, but the concensus of opinion is that he is not suitable for the heavy jungle work of clearing and planting. Second, the land laws must be repealed and modified in order to permit rubber plantation companies to hold at least 20,000 hectare tracts for twenty years with privilege of extending their grant for another twenty years.

As a corollary to the enactment of these laws, Congress must pronounce a definite policy and fix the political status of the islands for at least fifty years. Otherwise, the laws will not be worth the paper they are printed on. And, following the precautionary precedent of Great Britain, if we are to remain secure in the possession of this source of great wealth, a huge American naval base should be established at Manila, Zamboanga or Davao. If the British are justified in defending their rubber empire against possible attack from an imaginary enemy, then some way will have to found to circumvent the Washington treaties to protect our own equally valuable rubber world. Of course, the Washington treaties effectively cover the islands but we might paraphrase the British pretext and see some unfortunate future misunderstanding with Great Britain over rubber or oil, in which case the Singapore naval base would loom very prominent on our insular horizon and we would find ourselves caught in the Philippines a long, long way from home with no covering but a gee-string.

Anglo-American friendship will undoubtedly stand the strain of the oil and rubber war and eventually find a compromise to these petty struggles for trade supremacy, nevertheless, it is exactly these commercial jealousies which lead to friction and bad-feeling.

Despite the fact that we are a long way from home in the Philippines, we believe that our wisest move is to cut adrift from past policies and remodel our entire Philippine program by the enactment of new labor and land laws reinforced by a definite pronouncement of their future political status. Such a solution is best for the Filipinos, best for ourselves and the only safe guarantee to Japan, Britain and France that the islands will remain as a buffer of empire, a neutral state that will make superfluous the vast expenditures that are bound to follow the establishment of the British base at Singapore.

* * *

Machinery Trade of China*

W. H. Rastall, Chief Industrial Machinery Division

THE Chinese market for industrial machinery is developing rapidly and American products occupy an important position in the trade. China imported over $41,000,000 worth of industrial machinery in 1921, of which the United States furnished an important share.

An analysis of the Chinese maritime customs, as applied to the machinery trade, provides information that is interesting as illustrating the position of the several countries in this trade. The situation is unique in that the country has long been considered as being unchanging. On the contrary, however, the situation reveals the fact that in 1921 China absorbed over $41,000,000 worth of industrial machinery. While this total is not large compared with the quantity absorbed by the important occidental countries, it is obvious that very substantial progress has been made.

The total imports of machinery into China, and the extent to which the United States and Canada participated therein are shown in the following table :—

Total Machinery Imports into China and the Participation of United States and Canada.

Year	Total	United States and Canada.	Per cent. Supplied by United States and Canada.	Total.	United States and Canada.
	Haikwan Taels	*Haikwan Taels*			
1902 ..	1,008,295	122,462	12.1	$635,226	$77,151
1903 ..	2,145,026	291,141	13.6	1,372,817	186,330
1904 ..	2,708,648	221,898	8.2	1,787,708	146,453
1905 ..	5,383,363	410,505	7.6	3,929,855	299,669
1906 ..	6,041,944	579,667	9.6	4,833,555	463,734
1907 ..	6,199,174	1,255,061	20.2	4,897,347	991,498
1908 ..	6,786,656	810,756	11.9	4,411,326	026.991
1909 ..	6,010,212	342,298	5.7	3,786,434	215,648
1910 ..	7,103,137	576,321	8.1	4,688,070	380i372
1911 ..	6,561,020	382,054	5.8	4,264,663	248,335
1912 ..	4,704,485	179,803	3.8	3,481,319	133,054
1913 ..	7,137,048	673,227	9.4	5,210,045	491,456
1914 ..	8,157,270	681,170	8.3	5,465,371	406,384
1915 ..	4,485,867	659,722	14.7	2,781,238	409,028
1916 ..	6,131,258	1,078,530	17.6	4,843,694	852,038
1917 ..	5,982,715	1,411,141	23.6	6,062,196	1,453,475
1918 ..	7,860,290	2,390,332	30 4	9,903,965	3,011,818
1919 ..	14,328,249	6,407,727	45 0	19,916,266	8,906,741
1020 ..	22,536,254	12,181,382	54.1	27,944,955	15,104,914
1921 ..	54,898,590	21,199,400	38.6	41,722,928	16,111544,

China an Important Market for American Machinery

It will be noted that the United States and Canada furnished $16,111,544, or 38.6 per cent. of the machinery imported into China during 1921. This, compared with a total of $18,184,978, as reported in the export returns of the United States customs (a very satisfactory check, if allowances be made for the difference in classification and the period covered), indicates that China ranked fifth in importance among the foreign markets for American machinery. Such a showing is satisfactory when it is remembered that this country ranked only twenty-eighth in 1913 and fifteenth in 1910. American machinery exports to China in 1921 were 30 times as great as in 1900.

From the Chinese point of view the information conveyed by the above chart is deceptive because the currency of China is on a silver basis. The original returns, from which these curves were prepared, were in Haikwan taels, the value of which has varied from $0.63 to $1.39 in the period indicated (1902 to 1921).

Imports from Great Britain, Japan and Other Countries

Corresponding information regarding the participation of other countries is shown in the table, which follows. The hold which British manufacturers had on this trade prior to the war and the extent to which British interests suffered subsequently is illustrated by the figures. Marked recovery has more recently been observed, and 1921 figures show that the British total slightly exceeded that of the United States.

*This article is intended to bring to date a report entitled "Asiatic Markets for Industrial Machinery," published by the Bureau of Foreign and Domestic Commerce, in so far as it refers to conditions in China. This report can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., price 60 cents. It is a book of 332 pages and provides a great amount of information regarding the machiuery trade for entire Orient.

The Japanese figures are interesting as showing to what extent the manufacturers in that country supplied equipment to China during the war period, although this record has not been maintained since the armistice. It should be remembered, however, that the total volume of this Japanese machinery trade has expanded to such an extent that, even with this reduced participation, the yearly totals show consistent increase, as is indicated more clearly in the following table, which shows the value of machinery imports into China, with the exceptions of agricultural, embroidering, knitting, and sewing machinery :—

Value of Machinery Imports into China.

Year.	United States and Canada. *Haikwan Taels.*	United Kingdom *Haikwan Taels.*	Japan. *Haikwan Taels.*	Total from all sources. *Haikwan Taels.*
1911	382,054	2,330,209	465,122	6,561,020
1912	179,803	1,762,916	388,475	4,704,485
1913	673,227	3,241,590	548,522	7,137,048
1914	681,170	3,749,149	852,934	8,157,270
1915	659,722	1,994,518	851,185	4,485,867
1916	1,078,530	2,350,903	1,991,031	6,131,258
1917	1,411,141	1,648,869	2,419,813	5,982,715
1918	2,390,332	1,313,604	3,569,909	7,860,290
1919	6,407,727	2,073,968	3,604,905	14,328,249
1920	12,181,382	5,229,026	3,727,604	22,536,254
1921	21,199,400	21,267,694	7,142,163	54,898,590

Up to the end of 1921 German participation in the machinery trade of China had not recovered, and the general conclusion is that the United Kingdom and the United States will be the most important factors in the machinery trade of China from now on. These figures also suggests that American machinery deserves more active representation in the markets of China:—

Volume of Trade in General Types of Machinery

As further illustrating the situation in the machinery market of China, the following table shows the volume of the trade in each of the several general types of machinery enumerated in the returns of the Chinese customs :—

Imports of Industrial Machinery into China, 1921.

	Total.	Japan. Value. *Haikwan Taels.*	Japan. Per cent. of total.	United Kingdom. Value. *Haikwan Taels.*	United Kingdom. Per cent. of total.
Machine tools ..	940,337	292,772	31.1	295,877	31.5
Propelling machinery	5,163,781	255,433	49.5	3,350,784	64.9
Textile machinery ..	26,792,072	3,622,553	13.5	11,160,313	41.7
Brewing machinery	634,973	575,626	90.1	1,311	.002
Other machinery ..	21,367,427	2,395,779	11.2	6,459,409	30.2
	*54,898,590	7,142,163	13.0	21,267,694	38.8

	United States and Canada. Value. *Haikwan Taels.*	United States and Canada. Per cent. of total.	Germany Value. *Haikwan Taels.*	Germany Per cent. of total.
Machine toola	277,827	29.5	34,078	3.6
Propelling machinery ..	1,051,333	20.3	115,137	2.2
Textile machinery ..	11,768,212	43.9	131,492	.49
Brewing machinery ..	58,036	9.1	—	—
Other machinery ..	8,043,992	37.7	681,435	3.2
	21,199,400	38.6	962,142	1.75

It should be explained that in this report the returns from the United States and Canada have been combined, because large quantities of machinery manufactured south of the border are shipped through Vancouver, and therefore important quantities of American-made machinery are credited to Canada in the returns of the Chinese maritime customs. It is true that a certain amount of error probably creeps into the figures as they are published, because some machinery manufactured in Canada and shipped to China may be credited with that from the United States.

* This value is equivalent to $41,722,928 at the average rate af exchange for the year, which was $0.76.

The Different Markets of China

It should also be remembered that China approximates the size of the United States, and in this area there are several markets that are more or less distinct. In order that the comparative importance of these different markets may be estimated, as applying to the different classes of machinery indicated above, the data in the following table are also included:—

Comparative Markets for Machinery.

Markets.	Machine tools. *Haikwan Taels.*	Propelling machinery. *Haikwan Taels.*	Textile machinery. *Haikwan Taels.*	Brewing machinery. *Haikwan Taels.*	Other machinery. *Haikwan Taels.*
Shanghai ..	485,426	2,959,233	18,751,225	1,596	8,356,584
Tientsin ..	20,672	1,007,169	3,668,594	—	4,850,795
Dairen ..	286,254	444,750	671,213	3,621	1,871,501
Hankow ..	42,780	117,880	1,080,739	—	1,691,115
Kiaochow ..	42,470	161,232	1,944,776	629,913	407,937

The market for industrial machinery in China is developing rapidly and American manufacturers occupy an important, if not a leading, position in that trade, and the volume of business available there is such as to justify careful sales effort in order that the market may be developed up to its possibilities. While some of the particulars published above indicate that there is a certain amount of European competition, it should also be remembered that, for many classes of equipment, the difference between the European and American designs is such as to place these classes of equipment in quite a different grade. Therefore, the sales problem consists in educating the oriental buyers to the superior qualities of the American product.

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The Textile Industry in China

By George E. Sokolsky

THE industrial revolution in China is making itself most potently felt in the textile industry. Cotton mills, spinning, weaving and knitting mills are springing up in many provinces of the country. The following list gives the Chinese textile mills by provinces :

Kiangsu	49	Anhui	1
Chihli	9	Hunan	1
Hupeh	5	Kiangsi	1
Honan	4	Shansi	1
Chekiang	3	Fengtien	1
Shantung	2		

Of the 48 mills owned by Chinese in Kiangsu, 24 are in Shanghai and its immediate environs. Shanghai has thus become not only the centre of the textile industry in China, but of all industry, for textile mills outnumber all other industries in the country. The large number of mills in this particular field, however, have not yet been able to displace foreign commodities nor have they displaced the ancient handicraft system of spinning and weaving. In 1922, cotton goods was imported into China to the amount of Taels 151,567,436 or 16.04 per cent. of the total import. Cotton yarn was imported to the amount of Taels 66,955,734 or 7.08 per cent. of the total imports. Together they amounted to 23.12 per cent. of the total as compared with 5.23 per cent. for machinery imported. Raw cotton was imported to the amount of Taels 41,956 187 or 4.44 per cent. of the total import. Cotton products exceeded all classified imports and amounted to more than a quarter of the total import trade of China during the bad year of 1922.

This industry which has reached such enormous proportions and for which there are such splendid prospects, is now on the verge of bankruptcy. Three steps have been proposed to meet this situation. The Chinese Cotton Millowners' Association tried to raise a loan of $30,000,000 which was to have been guaranteed by the government in Peking. The government being to busily occupied making civil war in various parts of China or compromising with bandits, was unable to do anything at all for the cotton mills. The second step is assistance from textile machinery manufacturers in the United States and negotiations on this scheme are now under way, it is reported. The third method is usual in China : the mill owners are trying to mortgage their mills to Japanese banks and

to Japanese cotton mill proprietors. It is understood that some progress has been made in this direction.

The Chinese owned cotton mills in Shanghai (23 reported) represent a capital investment of Tls. 22,535,000 and $31,200,000. Behind this stands a reported reserve of Tls. 1,028,000. It might be accepted that mills not reporting reserves have none. It is this lack of reserve which is the principal weakness of the textile mills. Instead of piling up reserves the directors of mills have been paying enormous and in many respects ridiculous dividends. The effect has been that the Chinese mills have never had sufficient liquid capital to purchase raw cotton before the crop was harvested or early in the season. Their purchasing activities have generally been limited to the tail end of the season when prices were leaping skyward. Domestic raw cotton sold at better prices to Japanese and British mills which were financially in a position to handle the early drop. As for Egyptian, Indian and American cotton, the Chinese have seldom been able to finance large shipments and have been forced to deal through jobbers, which naturally increased the price to them. Likin is another factor in this situation, as it is in every commercial and industrial enterprise in China the cost of bringing cotton down from the interior to Shanghai is often prohibitive, making it advantageous to import Indian raw cotton or Japanese yarn. China at present grown only short staple cotton and therefore is dependent upon other countries for that commodity.

The position of the foreign mill owners is as follows: British, 5 mills; Japanese, 32 mills. There are no American owned cotton mills in China. The figure 32 for Japanese mills does not however represent the entire Japanese interest in this industry, since Japanese holdings in Chinese mills is considerable although invisible. The Japanese find it more economic to build mills in China for the China trade than to export yarn and cloth from Japan. This has been particularly true during the past few years, since the Japanese labor market has become disrupted by labor difficulties. With regard to spindles, the ownership might by stated be percentage.

Chinese	44%
Japanese	40%
British	14%
Load in fractions	2%
	100%

The British are hopeful of regaining their influence in the industry by utilizing a portion of the returned boxer indemnity funds for the erection and management of a textile school in Shanghai. The scheme provides for all the textile trade, including spinning, weaving, dyeing, bleaching, etc. The college is to contain the most modern British appliances and accessories and the classes are to be taught by expert Britishers who are to be able to teach in both the English and vernacular languages. The underlying idea of the plan is that the Chinese mill managers of the future, having been British trained and having become accustomed to the use of British machinery, appliances and accessories, will forever after utilize British goods in this industry. The Germans are to a certain respect forstalling the British plan by establishing a machinery company in Shanghai which produces spindles and other accessories, manufactured in China where there are no patent laws. This company, it is hoped by the Sino-German promoters, will eventually manufacture cotton mill machinery and all that is necessary for the industry. The British plan nevertheless is the most consturctive thus far advocate for the utilization of boxer funds, benefitting both sides.

The labor situation in the textile industry is an important factor, for with Chinese companies poorly capitalized, they are unable to withstand labor's demands, since strikes of long duration required a financial reserve for the capitalist as well as the laborer. In China, when laborers become dissatisfied with conditions in the factories they can always return to the villages from which they came. This is one of the explanations for the tremendous turn over in labor which all industries report. According to the report of the Chinese Cotton Millowners' Association, 67,707 laborers are employed in this industry in Kiangsu province. Approximately 50,000 are employed in Shanghai. Off-hand this appears to be an underestimation, although it is difficult to ascertain the truth in any purely statistical problem in China. Most of these laborers come from Shanghai, Ningpo, Pootung and northern Kiangsu. Most of them are women and children and hail from impoverished peasant families. Most of them are of the class known as occasional laborers in the west, although a certain element become industrialized and settle down in Shanghai as urbanized laborers. According to estimates of the *Chinese government bureau of economic information*, the wages for men range from $1.00 to $0.05 and for women from 0.25 to 0.15 per day. The average is about $0.40 per day for a twelve hour day. Children of all ages are employed except in a few mills. Only in a few mills are any educational facilities provided for the children. Some mills have made medical and sanitary provisions. The most progressive mills in Shanghai are those owned by the Naigai Wata Kaisha and managed by Mr. Okata. Chinese mills under the supervision of Mr. C. C. Nieh and Mr. H. Y. Moh have made some progress in providing more suitable working conditions. The Ewo mills will hereafter restrict child labor.

Several devises for restricting child labor have been put into operation, almost all of which have failed because the Chinese laborers themselves favor child labor as a source of further earnings for the family. Mr. Okata attempts to restrict child labor by requiring that all workers measure at least four feet. The defects of this method are obvious, particularly since so many of the poorer Chinese are dwarfed. The other alternative is to guess the age from the face. Visits the writer made to many cotton mills convinced him that both these methods are doomed to failure and that there can be no adequate solution of this problem until the Chinese government has taken the matter in hand along Western lines, that is, by compulsory schooling and heavy penalization for the employment of children. In its present condition, China is unable to enforce any laws and therefore nothing will be done. such employers as are paternalistic will sacrifice profits by assisting their workers; while, other will continue to exploit labor in the most brutal fashion.

The theory that labor is cheap in the Chinese cotton mill is altogether fallacious. Labor is abundant but not cheap, for the Chinese worker is physically weak, undernourished, careless and weary. He lacks in efficiency and in interest. The desire to do a job well is foreign to the Chinese worker, who expects at best to save a small sum to return to the country for an old age of idleness old age meaning from forty onwards.

With a labor problem so serious, with under-capitalization and practically no reserves, the position of the Chinese cotton mills is exceedingly difficult. But added to these, is the psychological and traditional unwillingness of the management of these mills to employ either foreigners or foreign-trained Chinese to manage the mills at adequate salaries. In most of the Chinese-owned mills the rule of thumb still holds in spite of all the developments which have taken place during the past decade in the industry. Many young Chinese study textile engineering at American universities only to find that it is either impossible to find employment in China, or that they can find employment only at ridiculous salaries. The Chinese system of paying small salaries and the worker depending on a large bonus at the end of the year is altogether unsatisfactory. The worker gambles against the financial acumen of his employer. The textile engineer might do everything possible to make the mill modern and properous and he may fail through the supine incompetence of his board of directors. The younger, foreign-trained Chinese are unwilling to take this chance. They insist upon living wages at the outset. The old-fashioned Chinese directing cotton mills are horrified at the suggestion that they pay a mill manager a large salary. They want men to work at Mex. $150 a month, which is inadequate, with the result that they are unable to get the right type of man and they are unable to have their mills properly managed.

The lack of skilled and trained management in the mills is having the effect of demoralizing the industry. Machinery runs down, little progress is made in dyeing and bleaching, etc. The mill's progress is only in the direction of more spindles and more looms, a good half of which are idle most of the time. The emphasis on size is characteristic of the industrial development of China. Shares in companies can only be sold if the proposition is large in appearance even if not in fact Chinese investor have had several unfortunate experiences in this direction, for all the paid in capital has gone into building and equipment and nothing remained for operation.

Municipal Government in China

By Laurence Impey, A.M.I.M. and C.E.

IN the sense in which municipal government is understood in other countries it may truly be said that in China it is still in its infancy.

The largest cities, such as Canton, Hankow, Shanghai, Tientsin, all have their own foreign concessions where such municipal undertakings as roads, lighting, water supply, drainage, etc., are carried out by the foreign committee or municipal council concerned, or by some company operating more or less under their control.

In none of these cities, with the possible exception of Canton, does there appear to be any spirit of public enterprise on the part of the Chinese, who apparently prefer to let things 'gang their ain gait,' as was well instanced by the expression used by a Chinese who had studied in both France and America, when he explained to the writer that his 'idea of a democracy was a country where he could use his own doorstep for any purpose he might desire.'

This critical comment on the uses of modern drainage will seem a trifle severe to those who are used to their own definitions of democracy and civilization, but nevertheless it is interesting as an example of how little an education abroad may influence a trend of thought moulded by ancient and accepted customs.

Peking, which is the capital of the country, is the first city in China which ought to endeavor to carry out some semblance of real municipal work, and it is well worth while to compare the form of organization which prevails abroad with that which is growing up here in the Far East.

The ministry of the interior is theoretically responsible for all the municipal governments in China, but in actual practice the work in Peking devolves upon the municipal council and the police board.

The minister of the interior holds the office of president of the municipality also, but in view of the frequent changes of government the work really devolves upon the vice-president, who is nominated by the president of the republic on the personal recommendation of the minister of the interior, and with the concurrent approval of the Peking chamber of commerce.

This vice-president is assisted by a second vice-president, under whom are four heads of departments and four assistant heads of departments, while these officers have the power to appoint the minor officials, namely, forty-two secretaries, four engineers, six architects, eight investigators, and various clerks and petty employees.



The Peking Water-carrier
He supplies nine-tenths of Peking's population with water just as he did a thousand years ago

These officials appear to correspond more or less with the mayor and corporation of and American or British town, with their salaried staff of town clerk, borough engineer, medical officer of health, and their office assistants, though it is true that the work that they undertake in China is not nearly so specialized, and the technical part of it is largely handled by the Peking police department.

As far as can be ascertained and tabulated the work of the various departments in the Peking municipality is subdivided as follows :—

Department One

1. Correspondence Division.
   Handles all mail, notices and proclamations, superintends filing.
2. Accounting Division.
   Auditing accounts, responsible for receipt and payment of money.
3. Editing Division.
   Prepares minutes of meetings, reports, has charge of maps and books.
4. Miscellaneous Division.
   Responsible for purchase of materials, also supervision of minor employees.

Department Two

1. Political Division.
   Handles public health affairs, industry, relief, and city business.
2. Property Division.
   Care of city property, revision of regulations.
3. Investigation Division.
   Laying out streets, issuing building permits, buying and selling property.

Department Three

1. Construction Inspection Division.
   Preparation of estimates, inspection of construction work.
2. Surveying Division.
   Surveying of roads, bridges, sewers, preparing maps.
3. Engineering Division.
   Planning of engineering work, preparing designs and working drawings.





The Canal South of Manchu City.
This serves to carry off the bulk of the surface water over a large area of Peking, and was formerly used as a moat for defensive purposes also



Peking Roadway of the Past

The road leading to the Palace. built in the fifteenth century, but quite unfitted for motor traffic



An Ancient Chinese Bridge

The graceful outline reveals the design of architectural artist of Peking

Department Four

1. Construction Division.
   In charge of work connected with roads, bridges, sewers, etc.
2. Estimating Division.
   Superintending contract work, preparing estimates.
3. Material and Supply Division.
   Purchase of materials, sale of materials, issuing of materials to jobs.

It will be noticed that these divisions overlap considerably from the point of view of one who is accustomed to corporation work, doubtless finding employment for numerous friends and relatives of the powers that be, but presumably rendering the satisfactory execution of work somewhat difficult owing to conflicting orders and opinions.

The money to carry out necessary work is obtained by the Council from various sources, amongst which may be mentioned taxes levied on stores, vehicles, prostitutes and their residences, theatres, the sale and mortgaging of property, and the rent of property owned by the city, all contributing their quota, totaling in all about $60,000 per month.

This sum, one would imagine, should be ample for good upkeep of the city, but in point of fact it appears to be used for various other purposes, some of them probably unconnected with municipal government, and it is stated that the minister of the interior has to meet an annual deficit, the causes of which would almost certainly vanish under the supervision of an expert accountant.

The police board appears to have the handling of considerable sums of money which are to be expended on corporation work, and it is likewise responsible for the collection of most of the taxes which comprise the revenue of the municipality.

The inside department of the police board is divided into seven sections, which control street lighting, issuance of building permits, roads, sewers, public conveniences, hospitals, and fire prevention.



The drainage canal running south from the Forbidden City through the Legation Quarter, whence it passes through the water gate under the city walls and empties into the canal south of the city as shown above



Peking Roadway of the Present

Under construction. the barrow men are the ubiquitous servants of the Municipality, transporting with equal facility earth, sewage, rock, foodstuffs or passengers

The outside department execute the above work, and supervise also the workhouse, the reform school, the city hospitals, the markets, and the city museums.

Practically all these various branches of public service come under the control of the city corporation in most other countries, being in the departments of the town clerk and the borough engineer for the most part.

The duties of the medical officer of health in other foreign municipalities are fulfilled by a board of health which functions under the police board, and which is said to control the cleaning of streets, supervision of sewers, the health of the city and prevention of infectious disease, inspection of food supplies, supervision of hospitals, doctors, midwives, and chemists and druggists.

Unfortunately the carrying out of these all-important functions is in the hands of officials who, however energetic and desirous of well-doing, have no technical training which will enable them to promote the work to the best advantage, and as a result the public have to suffer.

The city water supply is more or less independant of their control, as there is a water company, founded in 1908, which serves part of the Peking area, though the price of one cent per twenty gallons is regarded by the Chinese as so exorbitant that there are only about four thousand private customers from a city population of nearly one million people.

This water supply is taken from the Sun Ho, a river to the north-east of the city, passed through three reservoirs, clarified, and put under pressure by means of a 170-foot water tower.

There are over one hundred miles of pipe lines throughout the city, supplying the families aforesaid and also the hydrants, whence a great number of people carry their water in buckets, a man being stationed at each of the four hundred odd street hydrants to collect the water tickets issued by the company, and to supervise the distribution of the water.

An analysis which has been made of the water would seem to be quite satisfactory from a medical point of view, though the hardness is perhaps rather pronounced :—

	Parts per 100,000
Solids in solution	26.4
Chlorine	1.3
Nitrogen	.081
Saline ammonia	.0004
Sulphates	.001
Iron	1.5
Phosphates	Nil
Nitrates	Nil
Bacilli	Nil
Hardness of water	9.0

This water supply has sufficient pressure to be used for the fire hydrants, having a capacity of 300,000 gallons per hour, but unfortunately it does not cover the area of the small *hutungs* or side streets, which get their water by bucket from one of the numerous surface wells.

These surface wells vary in depth from thirty feet to one hundred feet, though various attempts have been made in sinking deep wells to three or four hundred feet without much success in striking a good flow.

The water coolie, with his wheelbarrow carrying two large tubs of water, is a very familiar sight in Peking's highways and byeways, for there are some two thousand of them in the city, united in a guild of watercarriers, an example of trade unity which is imitated by most of the coolies who are employed in industrial and other forms of labor.

Water from this source costs one cent per four buckets, and it seems that the supply is fairly satisfactory, for there is very seldom any epidemic which could be ascribed to this origin, and the demand is sufficient to enable the vendors to compete successfully with the Peking Water Company.

There is a surface water drainage system covering the city which was built some eight hundred years ago, but it cannot now be said to be very efficacious, as the hundred and fifty odd miles of sewers are built of stone blocks, which have shifted with the passing years, until much of the water percolates through the cracks, probably only half being eventually delivered to the canals which intersect the city and deal with the overflow in bulk.

The volume of water in the rainy season is such that the existing system is totally inadequate to handle it, and oftentimes the flood stands eighteen inches deep on the main streets after a storm.

In practice it appears that most of the houses use a soak-away pit for their waste water, though a good many of them have a pipe delivering into the street, in spite of the fact that the police profess not to permit this.

There is no sewerage system proper, the night soil being carried away in wheelbarrows and used as fertiliser, as is the custom in most countries in the East ; and apparently there are no bad results from it beyond the inconvenience of such a practice, and it must be admitted that in such a low-lying city as Peking, with its practically uniform levels and water-bearing soil, it would be somewhat expensive to instal the necessary sewers and pumping stations.

Under the pressure of circumstance, to wit, the number of Peking politicians who own motor cars, the roads of the city have recently been much improved, and the six steam rollers owned by the municipality are in constant use for construction or repair work.

The stone supply comes from the quarries in the western hills, and if the light railway system was used more effectively for its transportation, there is no reason why the whole of Peking should not possess metalled roads within the next decade.

The tramway system which is under preparation at the moment will doubtless affect this considerably, but in the writer's opinion it will be an unnecessary adjunct to the city, for the Chinee ares seldom in such a hurry as to need rapid transportation, foreigners are grouped in such a small area as not to require the service, the picturesqueness of the city will suffer greatly, while if the trams are a success there will be great hardship inflicted on the numberless ricksha coolies, who are already living on the verge of destitution, and whose transportation rate of ten cents per hour cannot compete with the rapid service and cheap fares on the tramways.

The upkeep of the roads devolves upon the police board also, and one must admit that they do fairly well at it, though their system of dust prevention through sprinkling water from a tub by means of a willow basket on a handle is as primitive as can well be imagined.

The annual budget for cleaning and sprinkling the main roads amounts to $144,000, while the cost of maintaining the *hutungs*, or side streets, is charged to the householders, which, in view to the fact that there is no tax on property or dwellings in Peking, is only reasonable.

The lighting of the highways is also done at public expense, electric current from the Peking Electricity Company being used in part, some incandescent gas burners in other places, while the majority of the streets are lighted by oil lamps of an inferior type.

Private houses are also supplied with electricity, but owing to the fact that the power station is badly run or that the generating power of the plant is insufficient, the lights in most of the houses are almost useless from 6 p.m. till 11 p.m. when so many people have gone to bed that the current supply improves considerably.

It must be recognized when considering the municipal organization of Peking that most of the improvements outlined above lie in the tartar or north city, which was first laid out in wide streets as being the residential quarter of the Manchu or ruling race, and this same area is now maintained by the republican government of China for much the same reason.

With the income which is available from various sources there is no reason why Peking should not have a municipal organization and government of a first-class nature, and if the open space and parks were utilized to the best advantage, the roads suitably maintained, an adequate drainage system installed, and sanitation and public health properly attended to by qualified officials, there need be no cleaner, healthier, or more attractive city throughout the Far East.

But in order that this object may be attained it is necessary that the authorities responsible for municipal government in China should have an efficient staff, properly trained and equipped with the most modern and scientific appliances and ideas.

In saying this no reflection is cast upon the police force, who have achieved marvels in a province which is really outside their scope, but it must be recognized that they have not the knowledge required to advance their municipal duties with the times, and that this unavoidably results in over-staffing and incompetency, with that consequent waste of public funds which it is the duty of a municipality to avoid.

It is an interesting point to notice in conclusion, that China has arrived at her engineering achievements from a totally different direction to that taken by other countries, for whilst in Europe and America the initial steps in promulgating works for the welfare of the public have usually been taken by the municipalities and cities, who have constructed their own drainage systems, roads, and bridges, in China and also in Japan the state has been the chief motive power.

Three thousand years ago the paternal government of China recognizing its duty to its subjects, was constructing such engineering works as the grand canal, state highways which ran the length and breadth of the land, and vast national granaries in which could be stored agricultural produce against a time of famine and need.

The procedure now seems to be reversed, for while other nations are tending to place engineering construction of public importance more and more under governmental control, the Chinese are gradually turning towards the development of a municipal system, as already instanced in Peking and Canton while the responsibility for the building of state high ways and bridges has devolved upon the various provincial governments.

If this nascent spirit of municipal enterprise can be fostered and encouraged it should prove to be the foundation of a vast field of engineering, which would provide scope for the use of large quantities of articles of both Chinese and foreign manufacture, and the employment of numerous skilled technicians, while the resultant benefits to the nation in health and efficiency would be almost incalculable.



Present Appearance of the New Hongkong and Shanghai Banking Corporation's Building at Shanghai

"WAY-FOONG"

The Hongkong and Shanghai Banking Corporation

The Pioneers of International Co-operation in China
Its Great Services to China and the British Empire

THE history of modern banking in China dates from April, 1845 (two years after the island of Hongkong was formally ceded to Great Britain in the Nanking Treaty), when the Oriental Banking Corporation opened a branch in the new possession. This institution was soon followed by others and in the next twenty years the following banks had established branches in Hongkong: The Agra and United Service Bank; The Central Bank of Western India The Chartered Bank of India, Australia and China; The Chartered Mercantile Bank of India, London and China; The Commercial Bank of India;



The Head Office of "Wayfoong" at Hongkong

The Comptoir Nationale d'Escompte de Paris; The Bank of Hindustan, China and Japan; The Asiatic Bank and the Bank of India. All except three of these are memories, wiped out in the great Bombay slump of 1866 and the failures which characterized the depression of the three following years. At that time the profitable opium trade was largely controlled by Bombay merchants. Any financial disturbance in this centre of India trade activity was immediately reflected throughout the ports of the Far East, where the banks were merely branches having no direct interest in promoting the special needs of their localities. When the Bombay speculators promoted



THE STATELY HOME OF THE HONGKONG AND SHANGHAI BANKING CORPORATION ON THE BUND AT SHANGHAI: AS IT WILL APPEAR WHEN COMPLETED

From a Drawing by Cyril A. Farey; Architects, Palmer and Turner; Contractors, Trollope and Colls (Far East) Ltd. The 3,700 tons of structural steel used in the construction of the building were supplied by Redpath, Brown & Co., Ltd., of London



The Banking Hall: Looking North



The Chinese Banking Department

the Royal Bank of China holding the majority of the shares in their own hands, they made possible the movement which resulted in the creation of the Hongkong and Shanghai Banking Corporation for the furtherance of commerce and industry in China under a board of directors who actually lived in the country and staffed by men with an intimate knowledge of local exchange and methods of conducting business. The story of the inception of the Hongkong and Shanghai Banking Corporation has been told by Sir Thomas Sutherland, its original promotor. In 1867, he was superintendent at Hongkong for the P. & O. Company, boarding every mail steamer on arrival. On one occasion the steamer happened to be the *Ottawa* whose captain communicated to him that the wild speculators of Bombay had started a bank to be called the Royal Bank of China whose shares had all been taken up at a high premium, with the exception of a limited number set aside for subscription in China where the directors were to be found and the dividends earned. A representative of the Bombay shareholders was to arrive shortly in Hongkong for the purpose of forming the board, distributing the modest allotment of shares and superintending the inauguration of the business, and the captain urged Sir Thomas to get in on the ground floor of such a promising speculation.



The Octagonal Entrance Hall

The news of this venture had been widely conveyed in the correspondence from Bombay to firms in China, but failed to excite interest either in the press or with the merchants. Sir Thomas says that he was disgusted at the idea of a great community like that of China being made the catspaw of a gang of Bombay speculators and set out to write a very modest prospectus of a local bank basing his views as to success on the same principle of co-operation as had been so successfully carried out in connection with the Hongkong insurance companies, then earning very handsome dividends. Securing the adherance of a legal friend in the promotion, within a few days most of the prominent firms in China had accepted the idea and joined the provisional committee. When the prospectus was advertised the shares were subscribed for many times over: a colonial charter was applied for and promised and when the commissioner of the Royal Bank of China arrived from Bombay he could not place a single share or win a solitary adherant to his foredoomed enterprise.

The Hongkong and Shanghai Banking Corporation thus started out on its career as a co-operative bank for the express purpose of promoting China trade and industry under local management and direction in which all business propositions are decided by the local manager or by the Head at Hongkong. Among its founders were the leading foreign trading firms of the day and it speaks volumes for the liberal viewpoint of the British that from its very inception the bank has been international in its outlook, embodying in its plans the first practical adaptation in China of that principle of international co-operation since carried by the exigencies of politics to the creation of an official consortium in order to eliminate competition and spheres of special interest. The founders of the bank included the British firms of Jardine, Matheson & Company, the Sassoons, the Dents and others, the German firm of Siemssen, the American, Russell & Co., and some Parsee merchants. Its first manager, Mr. Victor Kresser, a Frenchman, was taken over from the local branch of the Comptoir Nationale d'Escompte de Paris. This sweeping aside of national trade jealousies to more better addance the general interests of the China commercial community characterized the policy of the bank until war conditions forced a severance of relations with the Germans and a more stringent adherance to purely national interests. At one time the Hongkong taipans of the German firms of Melchers, Siemssen, Carlowitz and Arnhold, Karberg & Co., all sat on the board of directors, with American interests partially represented by Shewan, Tomes & Company at a time when Mr. Tomes, the American partner, was active in the affairs of the colony. In fact, it may be said that although representative of British interests in China, the Hongkong and Shanghai Bank was built up on a solid basis of international goodwill for the advancement of foreign trade in China, the only road to real success in this highly competitive market.

This spirit of co-operation with its elimination of destructive competition has been the key-note of the bank's policy and had this spirit been accepted at the beginning in the same frank manner it was offered, the history of China since 1898 might have been written on a different and larger scale, as it is difficult to dissociate the activities of the bank from the really big political events of the past twenty-five years. Lest we forget, it is well that the present generation should be reminded of some of the main events which bear out the above statement. Previous to 1898, the Hongkong and Shanghai Banking Corporation as the leading British financial institution of China had a working agreement with the Deutsche-Asiatische Bank (representing German interests in this country) to pool all Chinese government loans and concessions, an agreement which worked to perfection until events in that year compelled its cancellation as far as railways were concerned by a new understanding restricting British operations to the Yangtze valley and the Germans to Shantung and north of the Yellow River. This was the first example of independent international co-operation in China which had to be abandoned because of the momentous political forces set in motion when China's secret alliance with Russia brought the latter into Manchuria and presented her with an icefree, deep-water port on the Pacific, a challenge to British supremacy at that time which could not be lightly ignored. Add to this the intrigues through which Russia hoped to gain an easy access to the northeast frontiers of India through the territory of China, compelled the adoption of a program parcelling China into what has erroneously been designated as spheres of influence, in reality, zones of strategy, concealing the determined moves of different nations to protect themselves against the onward march



Marble Staircase at South End of Bank

of Russia under cover of her secret alliance with China.

Before this menace, it became necessary for the British to revise their ideas of international co-operation and protect their interests through the creation of a special instrument for the acquisition of and execution of concessions designed to counteract the plans of Russia and Germany. The Hongkong and Shanghai Banking Corporation and Jardine, Matheson & Company, the two strongest British institutions in China, stepped into the political ring by organizing the British and Chinese Corporation to carry out the policy of its government in the financing and construction of railways and other concessions for the safeguarding of national interests. Although this combination subsequently incurred bitter criticism and opposition from independent Britisih concerns, it must be said that they were fully entitled to the preference of their government, as they were on the ground, knew what was wanted, and took a chance. Notwithstanding the growls of those on the outside, it can be fairly said that the union of these two concerns has done more to advance British interests in China than all other influences put together. This combination still survives as the official instrument of its government, working at all times in the closest accord with the foreign office and legation.

As the Hongkong and Shanghai Banking Corporation led the way towards international good-will by combining with the Germans, so it extended the glad hand of fellowship to the Americans, for in 1899, six months after the American-China Development Company obtained the concession for the Canton-Hankow Railway, the British and Chinese Corporation entered into an agreement with the Americans for the amalgamation of their mutual interests in the Canton-Hankow and Canton-Kowloon Railways and agreed to divide equally all future business obtained by either party in China. Had this early contract of co-operation been carried out, Americans would have been saved from the fiasco of the Canton-Hankow deal and acquired a half interest in the most important railways and concessions in the Yangtze Valley.

Again, when the British group led by the Hongkong and Shanghai Bank reorganized the Central Chinese Railways, Ltd., for the acquisition and monopolization of railway rights in the Yangtze Valley in order to eliminate disastrous competition, fair participation was offered to the Amerieans who refrained from acceptance. A British-French-Belgian company was called into existence for financing these Yangtze railways, creating another international combine for harmonizing conflicting interests. Had the Americans accepted the invitation held out by the Hongkong Bank's subsidiary, they would now be participating in the Chinese Central Railways, Ltd. with a share in the Tientsin-Pukow and Pukow-Sinyang lines, avoided the clash over the Hukwang and Siems-Carey upper-Yangtze contracts and forestalled the consortium as a means of eliminating international competition. The success attending international co-operation in the Hukwang loan is populaily accepted in the United States as the first application of the principle to China, a triumph for American diplomacy and finance which brought into existence the original four-power group subsequently expanded after a bitter publicity campaign into the six-power and later into the present consortium. The credit for these amalgamations to eliminate spheres of interest has been accepted by Americans as a matter of course, but a knowledge of the real facts will reveal that this spirit of co-operation was early recognized by the Hongkong Bank as the only sensible policy for the development of China's great resources. Every attempt, however, to induce Americans to reciprocate this spirit was met with a rebuff and not until the stage was set for a theatrical demonstration in the Hukwang imbroglio and later on in the Siems-Carey contracts, did Americans evince the slightest interest in co-operation and then forced themselves into the combines they had refused to join or had broken away from; in both instances taking the credit for applying the open door doctrine.

The story of the Hongkong Bank's participation in these politico-railway battles forms one of the most interesting pages of modern Chinese history. The bank has often been criticized by competitors and independent operators for its methods in advancing British interests, but when it is understood that every European railway concession extracted from Peking concealed some secret



Compradore's Office

political move on the part of the Russo-Franco-Belgo group to place the British at a disadvantage, it is not to be wondered at that the official instrument of the British government was compelled to be always on the job at Peking with both eyes open in order to counteract the moves of their opponents. Other independent British banks might easily have been selected by their government to act as its instrument in China or been permitted to participate in the monopoly, but it is safe to say that any such combination would have invited disaster to British diplomacy in China. Through being on the ground with full and accurate knowledge of every move made in Peking or throughout the provinces, the Hongkong Bank has at all times been able to correctly estimate the importance of political contracts made by other nations and act on the spur of the moment in matters which other foreign banks or an unwieldy British group would have had to submit to a board of directors sitting on the other side of the world.



The Portico

The new international consortium and the Washington Treaties has saved China from partition and eliminated spheres of political and commercial interests, but it is well to recall that these safeguards to China's integrity are only the culmination of years of constant vigilance on the part of the British legation working at all times in close accord with its efficient financial ally, the Hongkong Bank, supported by the moral force of the open door doctrine. Every move made by Russia under cover of her secret alliance with China was at once checkmated in a practical manner by the ever watchful group at Peking. There was no time to discuss principles with a nation openly bent upon conquest, so diplomacy to be effective had to employ immediate and practical methods. This combination of legation and bank co-operating to checkmate China's duplicity and Russia's aggressiveness, resulted in wringing counter concessions from China for the protection of British interests.

It is well to recall briefly the high points of this desperate battle of concessions on which depended the life of nations and empires, and which, through ignorance of basic facts has been construed as a cold-blooded attempt to parcel China into spheres of commercial interests preparatory to her partition. At that time Russia was the menace to world peace, with her plans set for the subjugation of China and Japan and the ousting of the British from India. Thwarted in her attempt to reach India through Afghanistan and Tibet, Russia sought to reach the northeast frontiers of India through the territory of China, assisted at all times by her European ally and financial agent. When Russia secured her hold upon Manchuria as a result of her secret alliance with China of 1896, she openly extended her sphere of influence into North China, extracting promises from the Chinese government that all railways north and east out of Peking should be built by Russian capital. In order to save the Peking-Shanhaikwan Railway from falling under her control, it became necessary in 1898 for the British to act quickly and make a loan of £2,300,000 to the Chinese government secured on the physical property and earnings of this line and to tie it up under British direction for 45 years. The combination on the ground advanced the funds through its subsidiary, brought the railway under British influence, saved Peking from Russian domination and China from partition. Unless backed by the weight of military power, the open door doctrine would never have operated to save China under these conditions. It required prompt action of a definite character. The Hongkong Bank with its headquarters on the ground supplied the action.

It then became necessary to confine Russia's activities to territories north of the great wall in what is known as the Scott-Muravieff convention of 1898. Within a few months however, Russia was breaking her pledges by working with the Belgians to obtain the Peking-Hankow Railway concession which would





Manager's Office

bring her into the heart of the Yangtze Valley. Always alert, the British soon discovered the connection and protested to China against conceding this right to Russia. The British minister was solemnly assured by the Chinese government that Russia had no interest in the concession. Four days later, the concession was signed, disclosing that the Russo-Chinese Bank had been nominated as the fiscal agent of the loan in China. For this breach-of-faith China was compelled under an ultimatum to concede to Great Britain compensatory damages which took the form of five railway concessions which were at once transferred by the foreign office to the official group headed by the Hongkong Bank for execution. Again, the combination worked without a hitch to preserve China from the consequences of her own folly and incidentally erected certain essential barriers in the Yangtze region to any further Russian advance through Chinese territories towards her ultimate goal in India.

The British felt comparatively safe with Americans holding the southern section of the great north and south trunk railway and were willing to split fifty-fifty with them in all future concessions. The Americans dragged along their work and the shares of the American China Development Company offered for sale on the open market were bought up by the Belgians until they acquired the majority, when they insisted upon taking over control. The old connection with Russia still held, and once more British interests were menaced by the possible transfer of the American concession to a group working as the agent of their traditional enemy.

The British patiently awaited developments and when, under pressure of Chinese public opinion, the Americans consented to a cancellation of the concession and indemnification for work accomplished and loss of prospective profits, their chance came. In order to recover the concession, the Chinese had to pay the sum of $6,500,000 gold, and as usual, had no funds. The Hukwang Viceroy applied to the German Bank for a loan and while negotiations were being carried on in Peking, the British got busy and within a few days raised the money from the Hongkong government, handed it over to Viceroy Chang-Chih-tung in return for a promise that if at any time in the future foreign capital was necessary to build the line, the Chinese would first apply to the British. So when the Americans stepped out, the British stepped in, destroying any possibility that this important strategic and commercial artery might again fall into possession of her enemies and used as an instrument to undermine her position in Hongkong. Another instance of the close working of the combination whose success was due entirely to the fact that it included a bank which did not have to refer matters to a board or a group directorate sitting in London. Although the financing of this railway is now included in the four-power Hukwang loan, the important section between Canton and Hankow is to be built, equipped and managed by the British participants, a triumph for the Hongkong Bank.

That cordial spirit of co-operation which lies at the bottom of the Bank's present prosperity, together with its willingness at all times to assist any legitimate scheme for the development of China may be better elucidated by the following story. When Dr. Sun Yat-sen received the mandate to create a national railway corporation for the financing and construction of a national system of railways, he was ridiculed as a dreamer, because he had the vision to look far into the future to the time when China would need 100,000 miles of railways. The public did not know that this preliminary scheme for publicity purposes was afterwards trimmed down to an immediate working scheme of 10,000 miles of well designed and urgent lines. When the map and outline of the scheme together with Dr. Sun's and his representative's credentials were laid before Sir Charles Addis, the London manager of the Hongkong and Shanghai Banking Corporation, and he was asked his opinion, he did not laugh or jeer and call it a dream. The Hongkong Bank knew every foot of China, its needs and the possibility for development. It knew that a railway between any two capitals of China, under efficient management, would prove profitable. The dream of Dr. Sun Yat-sen is the vision the Hongkong Bank has always before it, the goal of its endeavors, and it took Sir Charles just ten minutes to make his decision. There was no hesitation, no long drawn out directors meetings, conferences with the foreign office or requests for preliminary surveys and assurances that the lines would pay: Sir Charles simply said "*we will take every mile of railway that Dr. Sun can give us.*"

Instead of remaining in London and concluding a preliminary agreement with the Hongkong Bank which would have settled the question of international co-operation and the elimination of the spheres of influence, the representative of Dr. Sun, at the invitation of the American group, proceeded to New York to give the latter the prestige of signing this epoch-making contract, arriving in time to have President Wilson withdraw support to the American group and destroy all hopes of an international deal. There were any number of American financiers willing to take over a Chinese railway contract after they had sent out a commission (to be paid for by the Chinese government) to report on the feasibility of the lines and their earning capacity. The difference between this attitude and the prompt decision of the Hongkong Bank is one of the reasons why the latter now dominates the financial world of China, the difference between an institution specializing in its own field and the working of banking groups who attempt to cover the world.

This same spirit of co-operation was again evidenced in the independent British contract signed by Pauling & Company for the financing and construction of the Shasi-Singyfu railway. Although it interfered with what was generally accepted at that time as a monopoly of the official group, the Hongkong Bank swung into line with Erlanger & Company (Pauling's bankers) jointly guaranteeing the issuance of the loan for £12,000,000. It meant the opening up of China, greater prospects for trade in general and increased profits for British manufacturers. In the following year when another international company was organized in Paris by the Chinese government for the financing and construction of a national system of railways, in which the French and German official financial groups guaranteed their respective constructors, the Hongkong Bank once more stood beside Erlanger and Pauling and guaranteed the British share of the financing, amounting to £25,000,000. At that precise moment, the American government did not believe in international co-operation and killed this scheme to eliminate the spheres of influence by refusing to support the American participant.

These typical incidents bear eloquent testimony to the broad policy of an institution whose first concern is the advancement of the general interests of the community it serves, bringing into prominence a truth that is sometimes lost sight of by other foreign traders in bemoaning their inability to compete with the larger British concerns whose success is due to the same basic principle that has carried the Bank to its enviable position in China. Like the Hongkong Bank, the premier British traders are China hongs first, last and always, indissolubly linked with the welfare of the country. They are not international traders with branches and ramifications covering the globe, but special firms having their headquarters in Hongkong, Shanghai, Tientsin or Hankow as the case may be, deciding all matters of business on the ground without reference to a board of directors at home or handicapped by market conditions and commitments in other parts of the world. Like "Way-foong," the names of "Ewo," "Taikoo," Soey Chee," (now changed) "Laou-kung-mow," the American "Sun-Chong," and many others, convey to the Chinese and old China-hands a significance that can never be attained by an international firm. They belong to China, and prosper or decline with the fortunes of the country. They are here to stay.

In an article in a recent number of *Trans-Pacific*, Mr. George Sokolsky invited attention to the same situation in the following words:

"A Bank is the same sort of an institution on main street that it is in New York and London. When it serves the interests of its neighbors and inspires confidences in itself, it succeeds. In China, the criticism of the foreign banks has been that many of them are sublimated exchange shops. They do not participate in the business of the community. They do not associate themselves with local development movements. They do not lend money for local industrial enterprises. Their business consists largely in forward bills, exchange transactions and current accounts. The fact that so many banks refuse to lend money on mortgages, and are unable to assist their nationals in new enterprises, hampers the growth of their national interests in China."

"If one studies the foreign settlements in China, one finds that in each one the local enterprises are largely British controlled. In Shanghai, the metropolis of the Orient, the tram system, the telephone company, the principal ice company, the gas company and the water works are British owned. The electricity department is Municipal property. Of nine Municipal Councillors in Shanghai, six are British, two Americans and one Japanese; the British predominate because they own or control the largest amount of property. During the student movement, when a wave of pro-Americanism manifested itself in Shanghai, a number of Chinese property owners offered to register their land in the American Consulate on condition that American financial institutions took up the mortgages with which British banks had accommodated them. No American banks offered to do this. They had no authority. They would have to consult an office in New York."

This tells the story of British success in China. They send out their best men, who look forward to a life-time of service in the country. They become a part of it, investing their savings in local enterprises and property. Their machinery for doing business is complete and when it comes to the larger matters affecting national prestige and interests they have the largest foreign bank in the world, whose directors are "Johnny-on-the-spot" to work in with their legation in a practical manner to solve delicate matters that would take months for a foreign board of directors to understand.

Apart from its activities in financing the various British built railways in China through its subsidiary, the Hongkong Bank has been the principal factor since 1874 in financing the Chinese government. At that early date and at a time when its fortunes were at a low ebb, it placed a loan of £600,000 with the Imperial Chinese government. Following this initial loan, various advances were made to China in the next fourteen years: 1877, £1,604,276: Eight per cent. silver loan Shanghai Taels 1,949,500: in 1881 also a silver loan of $4,384,000: 1885, £1,505,000: and another 6 per cent. loan of £750,000: 1886, 7 per cent. silver loan Shanghai Taels 767,200; 1894 Tls. 10,000,000: 1895, £3,000,000. It was not however until after the Sino-Japanese war of 1895 that the opportunity came for the Bank to assume its natural leadership in financing the Chinese government. In the following year it was called upon in combination with the German bank to advance the first instalment for the war indemnity amounting to £16,000,000 at 5 per cent. to run for 36 years and in 1898 this was supplemented by a further loan of the same size at 4½ per cent. to run for 45 years, both loans being secured on the customs revenues. These loans gave the Hongkong Bank its great prestige in China, as since 1911, the customs revenues have been deposited each month in the branches of the bank to the credit of the Chinese government subject to withdrawal by the head of the customs. In 1898, when the Germans were intriguing to have one of their men succeed Sir Robert Hart as inspector-general of customs, in order to safeguard their interests in the huge loans secured on its revenues, the British exacted a promise from the Chinese government that as long as British trade predominates in China the inspector general of customs shall be a British subject. In thus protecting its clients who subscribed to the two loans of 1896-98 the Hongkong Bank working in close harmony with its legation scored the biggest victory that has come to foreign financiers in the history of China. Other banks entering the field later on and failing to reap the benefits arising from being designated as a depository for Chinese government revenues, have at times misunderstood the Bank's position and charged it with manipulating government funds for the advancement of its special and national interests. These charges were renewed last year through a mistaken idea of the conditions underlying the handling of these funds and were suitably answered by the *North-China Daily News* in the following editorial:—

"The funds of the two services (Customs and salt gabelle) mentioned are distributed among certain banks, British included, but they stand in the names of the heads of the customs and the gabelle and are dealt with entirely as they direct. The only authority which any British bank would recognize in refusing to pay out would be an order from the British Supreme Court, and it is practically impossible to imagine any conditions under which such an order would be given. It may be said that instances have actually occured in which pressure was put upon the British banks to hold up customs money, which attempts completely failed. It will be recognized, of course, that there are certain loans which are a first charge upon the customs and salt revenues by agreement with the Chinese government, and the heads of these services will see that the interest is duly paid—just as the Inspector-General of Customs recently incurred the Chinese government's wrath by declining to part with moneys earmarked for the service of certain internal Chinese bonds. But this is a very different matter from saying that the British banks simply help themselves as they please and hand over what is left to the depositor."

Following the two large loans secured on the customs, the Hongkong Bank in 1905 furnished the Chinese government with a five per cent. gold loan of £1,000,000 and in 1912 subscribed for its share of the £25,000,000 reorganization loan divided amongst the five powers and employed by Yuan Shih-kai for strengthening his position. The salt revenues given as security for this loan carried the provinsion that the revenues should be paid into the issuing banks in China to the order of the inspector-general of the salt gabelle. The benefits arising from the handling these large revenues once more testifies to the wisdom of the banks who advanced the loan to China on condition that collection of the revenues be placed under foreign supervision. Although the Chinese claimed that the salt revenues properly managed would bring only $40,000,000 into the treasury, the estimate of the banks was about $25,000,000. In ten years of efficient supervision the total salt revenue paid into the group banks designated as depositories in 1922 after deducting administrative expenses, was $85,633,000 while $31,668,000 was retained by local authorities.

In addition to its loans to China, the Hongkong Bank has also issued some loans for Japan and last year issued one for £2,000,000 to the Siamese government for railway construction, which at persent stands at 8 per cent. premium. When, several years ago, the Hongkong government decided to provide a savings bank for the masses, arrangements were made with the Hongkong Bank to open a savings department which has proved a great boon to the public. A similar department is attached to the Shanghai branch.

Simultaneously with the opening of the head office in Hongkong the branch at Shanghai commenced business and other branches were later opened in the following cities: Amoy, Bangkok, Batavia, Bombay, Calcutta, Canton, Chefoo, Colombo, Dairen, Foochow, Haiphong, Hamburg, Hankow, Harbin, Iloilo, Ipoh, Johore, Kobe, Kuala Lumpur, London, Lyons, Malacca, Manila, Nagasaki, New York, Peking, Penang, Rangoon, Saigon, San Francisco, Shanghai, Singapore, Sourabaya, Sungei Patani, Tientsin, Tsingtau, Vladivostok, Yokohama. Once opened, no branch has ever been closed.

The original capital of the bank was $2,500,000, increased to $5,000,000 in 1872. Further additions brought it up to $10,000,000 in 1891, and in 1907 it was raised to $15,000,000. At an extraordinary meeting of the shareholders, held May 28, 1921, the authorized capital was increased to $50,000,000, of which 160,000 shares of $125 are issued and paid up, a total of $20,000,000.

So successful were the operations of the bank up to the end of 1916 that the accumulated reserves aggregated $33,000,000, or more than double the capital at that time. By the end of December, 1922, the sterling reserve was £4,500,000 equivalent to $40,373,831 and a silver reserve of $24,500,000, with cash assets of over $84,000,000, which included $24,700,000 in coin lodged with the Hongkong government against authorized note circulation. The bank had in circulation $41,883,655 in notes issued against securities and coin deposited with the Crown Agents for the Colonies, their trustees and the Hongkong government. These British government, Indian, Colonial and other securities held by the bank amounted to $103,013,844, which, with the cash deposited with the Hongkong government maintains the value of the note issues. On this date the bank had $366,620,124 in current accounts and $135,710,948 on fixed deposits.

The accounts of the bank are made up annually to December 31, and submitted at Hongkong in February. The shareholders in London register their dividends on advice by cable of the accounts having been passed. For each of the thirteen half years to December, 1913, the dividend was £2 per share, with a bonus of 5s. per share each time for the second halves of 1908, 1909, 1910, 1911, 1912 and 1913; for the first half of 1914, £2, 3s. per share; and for the second half of 1914, £2 3s per share, with a bonus of 5s. per share. For 1915, 1916 and 1917, £4 6s. per share was paid each year; for 1918 £4 8s.; and for 1919, £4 10s. with a bonus in addition of 5s. per share for 1915 10s. per share for 1916, £1 per share for 1917, £1 10s. per share for 1918 and £3 10s. for 1919.

On account of 1920, £3 per share was paid in August, and in January, 1921, a final dividend of £3 per share was announced, together with a bonus of £2 per share, making a total dividend for the year of £8 per share.

On August, 1922, an interim dividend of £3 per share was declared and a final dividend of £3 with a bonus of £2 per share, a total of £8 per share for the year, a total of $10,864,170 in dividends, or over 50 per cent. on the paid up capital of $20,000,000.

The bank has been fortunate during its long period of progress in the large number of far-sighted men who have guided its policy. The most prominent of its managers was Sir Thomas Jackson, Bart., who served from 1876 until his retirement in 1902 and is now honored in Hongkong by a fine bronze statute fronting the bank. On his death, the chairman of the court of directions paid the following tribute to his memory:

"Great and many as were the public services he rendered, his most enduring monument is the standard of commercial morality he set throughout the Far East. Nothing that was not generous, nothing mean or underhand, could abide his presence, and he leaves to those who follow a noble inspiring example of unselfish devotion to duty"

This stands at the foundation of the bank's policy, adhered to by his successors in office who have carried it to its proud position in the financial world of to-day. Mr. N. J. Stabb (now Sir Newton) was appointed chief manager of the bank in 1910 and was succeeded by the Hon. Mr. A. G. Stephen. Sir Ewen Cameron, K.C.M.G., was manager of the Shanghai branch from 1873 to 1889, and as the able lieutenant of Sir Thomas Jackson in Hongkong is entitled to rank as one of the founders of the bank. He later became manager of the London branch, was honored with K.C.M.G., for his advice to the British government on Chinese financial affairs, and retired on account of ill-health in 1905.

Sir Charles Addis, after a long career in the Far East, was appointed manager of the London branch in 1905, and continues to occupy that position. He was knighted in 1913 in recognition of his service as head of the British group in negotiating the Chinese reorganization loan and is now a director of the Bank of England. Mr. E. G. Hillier, C.M.G., was appointed Peking agent in 1891 and is the representative of the bank in its official relations with the Chinese government and the negotiation of loans.

In his speech at the opening of the bank, Sir Ronald Macleay, the British Minister to China paid the following well merited tribute to the work of Mr. Hillier.

"I cannot leave the subject of the consortium without mentioning another old and trusted servant of the Hongkong and Shanghai Bank, Mr. Guy Hillier who combines the post of agent of the branch in Peking with that of chief representative of the British Group in China. Mr. Hillier's skill in handling the intricate problems of the group's relations with the Chinese government, his remarkable proficiency in the language and knowledge of the Chinese make him an ideal adviser in such matters for H. M. representative in Peking; and his gentle nature and the wonderful serenity and fortitude with which he endures one of the saddest of nature's disabilities have won for him the affectionate esteem and admiration of a host of friends. He has a trusty second and a stalwart co-adjutor in Mr. R. C. Allen."

The same high words of praise should also be extended to Mr. Sydney Mayers, the Peking representative of the British and Chinese Corporation, upon whose shoulders has fallen the brunt of the delicate railway negotiations for the past ten years and keeping a watchful eye over the interests of the British bondholders in Chinese railways.

Mr. G. H. Stitt, the present manager of the Shanghai branch, also exemplifies the spirit which has made the bank that tower of financial strength which it is to-day.

To the Hon. Mr. A. G. Stephen, the present head manager, under whose spirited leadership and wise guidance the Shanghai branch was able to steer and even course through the storm years of the war and its aftermath of inflation and depression into the smooth waters of prosperity, much credit for the present position of the bank is due. The present structure in Shanghai was conceived under his administration, the plans made and the finances set aside which enabled this significant monument to be erected. The following extract from the speech of the chairman of the court of directors of the bank at its last annual meeting sums up his work and the esteem in which the shareholders hold its staff:

"I cannot conclude without a word of commendation to the staff. In the Hon. Mr. A. G. Stephen, our chief manager, we have a man whose knowledge of business and finance is unparalleled and whose services to the empire and its eastern connections is well-known to all of you. During the past two years, in a period of world depression, the bank has progressed under his able direction and its position to-day is stroner than ever. Amid the troubles and disasters throughout the world, the disorganization and uncertainties of exchanges, our men everywhere have risen to the occasion and have created a faith in the bank of the utmost value to trade and British prestige in the East. We are indeed fortunate in possessing a staff second to none in loyalty and devotion to the interests of their employers, and I am confident that as senior men retire their places will be taken by men of equal calibre and the bank will continue to be a tower of strength to Eastern trade and enterprise in the future as it has been in the past."

G. B. R.

The New Building

The architects are Messrs. Palmer & Turner of Hongkong and Shanghai. In the official description, Mr. G. L. Wilson, one of the partners who designed the building, renders due credit to those responsible for its erection, in the following foreword:

"*The Hongkong and Shanghai Bank deserve the thanks of the whole community of Shanghai for they have generously spent a large sum of money in beautifying the New Building so as to give pleasure and inspiration to all who see it.*

"*A great modern building such as this, equipped with all the latest time and health saving appliances which make for efficiency, is a complicated structure, and it is impossible for one man to design it in all its details.*

"*The modern architect therefore gathers about him assistant architects, engineers, artists, sculptors and other specialists, carefully selecting those he knows will work in sympathy with his ideas and aspirations.*

"*His position is, therefore, analogous to that of the conductor of an orchestra playing one of his own, compositions, and all those who contribute are deserving of thanks if the result is a success, for one false note is sufficient to create discord instead of harmony.*

"*I therefore take this opportunity of thanking all those of our office staff who worked so loyally on the drawings, Mr. Geo. Murray of London, the artist, for all the time and trouble spent in the preparation of the cartoons for the mosaic work in the entrance hall, and Mr. Faber, the structural engineer responsible for the design of the foundations and the steel frame.*

"*It was due to Col. M. H. Logan's initiative that the celebrated London firm of contractors, Messrs. Trollope & Colls, Limited, came out to Shanghai to erect the building, and Mr. H. Richardson, the local manager, deserves special praise for the rapidity of construction due to his skilful co-ordination of all the crafts and trades and organization generally. When it is remembered that very nearly the whole of the varied materials used have been imported, and that arrangements had to be made for their arrival at the precise time they were required for fixing, it is not difficult to understand the importance of organization. But for the failure of the Chinese contractor in Hongkong to supply the granite within the specified time, the whole building would have been completed last month.*

"*Mr. John Morley, the general foreman in charge of the building, also deserves great praise; dealing with Chinese labour for the first time he patiently taught them modern methods and thus obtained a better finish and standard of work generally, than is usually possible in China.*

"*The architect in China has many difficulties to overcome not met with in England. The architect in England for example can watch the finer fittings being made and alter them should be find that the spirit of his design has not been caught, but the architect in China is separated by ten thousand miles from the craftsmen working from his drawings and it sometimes happens that when the article is delivered the result is disappointing. It is then too late to make alterations. I wish, therefore, to congratulate the sub-contractors who supplied the various metal fittings, the marble work and the suppliers of the fibrous plaster ceilings: they one and all caught the spirit of the designs and produced work of which they may well be proud.*

"*It is for the community to decide whether the architect has justified the confidence placed in him and produced a building worthy of the opportunity which, as regards the size, site and in other ways, was an exceptional one. It is sufficient for him to say that he has given of his best.*

G. L. WILSON."

The building is of the type known as Neo-Grec, and to achieve the dignity with simplicity which that name implies the architects have eschewed the use of carving or sculpture almost entirely and relied upon proportion and line. They had an opportunity in the site and size of the building such as very rarely falls to the Architect's lot. The frontage of approximately three hundred feet to the Bund and two hundred feet to Foochow Road formed the ideal site for this memorial to the commerce and prosperity of the world. Rising one hundred feet to the long line of the roof and a further eighty feet to the final of the massive dome, the whole building stands out clear to the view of the merchant ships of all nations sailing up and down the Huang Pu, a recognition of their courageous industry which has made possible all that this memorial stands for.

From afar is seen the six-columned colonnade in the middle of the Bund front with the triple-arched main entrance beneath, forming their deep-lined shadows in the whiteness of the Hongkong granite with which all the principal facades are built. Approaching the sixty-two feet long flight of steps to the entrance the two bronze lions flanking it are a striking feature against the stone. These lions are seen to be of a novel character, in that one is roaring aggressive and the other quiescent. They have been cast from models prepared by Henry Poole, A.R.A., and are very happy symbols of protection and security.

The carved head forming the keystone of the middle arch of the entrance represents agriculture, the source of all wealth, and the similar heads over the two side arches are industry and shipping.

Passing through the bronze entrance gates one enters a spacious Portico, its inner archways filled with glazed bronzed screens. Beyond these is the entrance hall.

The Entrance Hall

The artistic conception of the bank has centred itself in this feature of the entrance hall. The hall is octagonal on plan, the motive combining the number eight which figures so largely in Chinese mythology with the idea (and practical utility) of the meeting and distributing place of commercial avocations. The octagon is fifty-two feet across and has the unusual feature of a dome of novel section. This is supported on eight detached Sienna marble columns. The outer arcade of the octagon is of the same marble. The bases and capitals of the columns are of bronze. The idea of the Dome, the conception of Aspiration, is carried upward connecting with the dome above the roof of the building; and, so that there shall be no break in the continuity of thought, even the medium of the finish is the same throughout. The dome ceiling of the entrance hall is of rich Venetian mosaic, and the outside covering of the roof dome one hundred and fifty feet above it is also mosaic, terminating in the golden mosaic of the finial.

The idea of aspiration is further emphasized by the decoration of the entrance hall dome, as the following descriptions will show.

The eight principal panels represent the banking centres of the East and West :—

LONDON

Central Figure.—" Britannia " with Trident and British Lion.
Left.—Figure with arms of " London."
Right.—Symbolic figure of Thames with model of ship, compass and rule.
Background.—Houses of Parliament and St. Paul's Cathedral from over the rider.
Heraldry.—England, Scotland, Ireland, Wales.

PARIS

Central Figure.—" The Republic " with tablet inscribed Libertê, Egalitê, Fraternitê.
Left.—Figure of the Arts with the Victory of Samothrace on prow of boat—*Louvre.*
Right.—With arms of the Republic.
Heraldry.—Fleur de lis, Paris. Paris Fieur de lis.
Background.—A view of the Seine and Paris, principally of the Cathedral of Notre Dame.

CALCUTTA

Central Figure.—Symbolic of " Mysticism " with the Star of India on Forehead.
Left.—" Philosophy " with scroll.
Right.—With the arms of the City.
Background.—The Hugli River and the High Court of Justice.
Heraldry.—Crest of Calcutta, and the supporters of the arms of Calcutta.

BANGKOK

Central Figure.—Symbolic of " Fertility."
Left.—Representing hewers of timber.
Right.—Agriculture and Rice Cultivation.
Background.—Temple at the mouth of the Chao Phya Menam River—the Mother of Waters.
Heraldry.—The Traironga—national flag.
Old arms of Siam
New arms of Siam.
The flag of the Royal Navy.

HONGKONG

Central Figure.—With Union Jack symbolic of its becoming a British Crown Colony.
Left.—History with date of above MDCCCXLII.
Right.—Suggessive of Canton River.
Background.—View of Hongkong and Peak from the Harbour.
Heraldry.—Flag of Diplomatic Service.
Chinese characters for Hongkong.
Flag of Admiralty.

SHANGHAI

Central Figure.—of " Foresight " or " Sagacity " with steering wheel.
Left.—Symbolic figure of the Yangtzekiang.
Right.—Shipping.
Background.—Hongkong and Shanghai Bank and the Chinese Maritime Customs from the river.
Heraldry.—The flag of the Chinese Merchant Service.
Chinese characters for Shanghai.
The flag of the British Merchant Service.

TOKYO

Central Figure.—" Learning."
Left.—Youth symbolic of " Progress " with national emblem on shield.
Right.—" Science " with scroll and instruments.
Background.—Enclosing wall of Imperial Palace.
Court of Justice, Admiralty and Government Offices. In the distance separated by a band of clouds Mount Fuji.
Heraldry.—The flag of the Japanese Merchant Service.
Japanese characters for " Tokyo."
The Imperial Flag.

NEW YORK

Central Figure.—Bartholdi's well-known figure of "*Liberty enlightening the world.*"
Left.—"*Hermes*" the promoter of social intercourse and of commerce among men, with his symbols the winged hat and caduceus.
Right.—Figure with arms of the United States.
Background.—A characteristic view of New York from the sea.
Heraldry.—The flag of the Merchant Service.
The arms of New York.
The American Eagle.

Between the panels are the characters of an inscription from the Chinese classics with the English words above, circling the dome : "*Within the four seas all men are brothers.*"

Surrounding and above these panels are the signs of the Zodiac :—

S. Aquarius	S. E. Pisces and Aries
E. Taurus	N. E. Gemini
N. Cancer and Leo	N. W. Virgo
W. Libra and Scorpio	S. W. Sagitarius & Capricornus

on a dark blue ground with wide gold borders.

Within and above again are :—

Eight heraldic lions in gold, and geometric symbols in squares—the Swastika (good fortune), Solomon's Seal (wisdom), etc.

And finally the circular topmost centre panel showing :—

Ceres, the Goddess of Plenty or Abundance.
Helios, the God of the Sun, and the Horses and Chariot with which he traverses the Heavens.
Artemis, the twin sister of Helios, the Goddess of the Moon, on her forehead the crescent.
One half of background, Day ; the other, Night.

The Bank

The plan of the bank radiating from the octagonal entrance hall is of the happiest simplicity. All parts are readily and easily accessible in spite of the diversity of the departments and the immense size of the building.

From the south-east archway of the octagon is reached the brokers' room and south of that is the managers' suite, consisting of managers' office, manager's private room, telegrams, books, stenographers, waiting room, with a private corridor giving access to each.

The accountant's department is approached through the north-east archway of the octagon. Eight telephone booths are provided around the entrance hall, six for the brokers' use and two for the general public.

The remaining five archways of the octagonal hall give upon the main banking hall. The first impression is of the grandeur of sheer space and proportion and light. This hall, running practically the whole length of the building, has an area of twenty-one thousand five hundred feet. The walls and columns are faced with soft-toned grey Italian marble with a seven-arched arcade throughout the length of the west walls in Sienna marble corresponding with the octagonal arcade of the entrance hall. The lighting, which has the effect of unobstructed open-air daylight throughout, is by the openings of the western arcade, the large bronze windows of the northern end and especially the great semi-circular vault of the lantern light above. This lantern is one hundred and twenty feet long and thirty-three feet span. Specially to be noticed in the marble work of this hall are the four monolithic columns, two at each end, which were worked in Italy and delivered to the bank without damage ; each column weighs about seven tons. At the South end of the banking hall is a double staircase of white and Sienna marble with an entrance-way from Foochow Road beneath. The staircase leads to the

Mezzanine floor where are provided the stationery rooms, Record rooms, manager's changing room, telephone exchange, staff changing rooms, tiffin and service rooms and lavatories. There is a corresponding mezzanine gallery as the north end and an entrance to the bank at this end from the private road. The strong rooms for books and documents are along the west side. The savings bank to the south-west of the banking hall has a separate entrance on the Foochow Road as well as from the main hall. The great impregnable treasuries, eighty feet long and thirty-five feet wide and nearly thirty feet high, occupy the north-west corner of the building, with the smaller treasuries around them.

The bronze work throughout the building calls for special notice; and nothing finer can be seen anywhere in the world. The main entrance gates, each of the three pairs weighing five tons, proclaim themselves as works of art. The revolving doors, electric light fittings, bronze grills, bronze screens, door furniture, and in fact all of the metal work, have been very skilfully designed and executed.

With the exception of the marble used in the accountants' department, which came from Devonshire Quarries, the whole of the marble used is Italian, very carefully selected and matched. The flooring to the public space is finished in marble mosaic with marble borders; marble mosaic was chosen as being less slippery than marble slabs during damp weather.

The design for the managers' office required very careful consideration; it is the hub of the whole bank, and the walls have been so broken with doors and windows that the ordinary design of panelled walls could not be adopted, but the difficulty has been overcome very happily. The rich ceiling, which is fibrous plaster modelled in England, also calls for special notice; also the fire places and fire grates.

The furniture to the general offices and the fittings in all strong rooms and book rooms are of steel made in England and shipped out in sections. The furniture in the managers' office and private room is of teak-wood.

The artificial lighting of the banking hall received special consideration, and a novel method has been adopted. The architects particularly wished to avoid the ordinary method of lighting, whereby points of light are seen through the hall, and so it was arranged that small search lights should be fixed in the central area at a considerable height above the Dome light and so flood the banking hall with artificial light, which should give the same effect as daylight.

The Chinese Bank

Whether one enters by the special south-west gateway from the Foochow Road or by either of the marble archways at the south-west corner of the main banking hall, one is arrested on the threshold by the totally unexpected sight of a blaze of Chinese decoration. This is the Chinese bank. The architect has attempted here the boldest scheme of decoration ever tried in a modern building, and he has been utterly successful. While the design, both in the mass and in its details, is entirely new, one feels the influence of the best traditions of fourteenth century Chinese art in this gorgeous Oriental decoration of a hall of twentieth century western construction. Those fortunates who have seen the palaces of Peking are immediately reminded of the dazzling colorings of those wonder-halls. For others the impression will be a new one of barbaric splendour, a riot of pure decoration for the laughing joy of color.

Passing to the compradore's outer office to the south of the bank one's joy sobers to smiles of appreciation of the intricacy of the gilded ornament of the beams, the gold and red and black. No riot here; a fine restraint, though still no fear of pure rick color and fantastic design.

Thence to the compradore's private room. The brightness is dimmed. The reds and greens and yellows have gone. Here the splendour curbs all smiles. Black and the dark blue of clam; the fit setting for the dignified office of compradore of the Hongkong and Shanghai Bank.

The Building Generally

The building is of fire proof construction throughout, practically no wood being used on the ground floor.

The upper floors are designed as suites of offices, which are served by four staircases and six electric lifts. Other staircases are provided for coolies and for escape in case of fire.

The most up to date systems of ventilation and warming have been adopted for these premises. Fresh air is drawn in at suitable points and washed by passing through a water screen. The cleansed air will in the winter be warmed and pumped through a system of ducts into the rooms. The vitiated air is drawn out through a separate system of ducts and discharged above roof level.

The materials for the building have been obtained from all over the world. No difficulties, no pains or trouble have been spared in finding and securing whatever seemed most suitable for the different parts of the structure. The crafts and trades of all nations have been employed The following list of some of the quantities of materials that were needed will give some idea of the vast extent of the operations

Structural Steelwork	3,700 tons
Steel Reinforcing Bars for Concrete ..	1,350 tons
Bricks	3,500,000
Cement	50,000 casks
Granite (83,771 cb. ft.)	6,481 tons
Patent Plaster	1,480 tons
Sand	5,500 fong
Cables	140 miles
Tubing	49 miles
Total weight of building about	50,000 tons

The huge edifice is supported by 2,600 Oregon pine piles, some of them 40-ft. long, but the general average being 25-ft. in length, twelve inches at the butt and ten inches at the tip. The frictional resistance of these piles in the Shanghai mud is over 1,700-lb. to the square inch. In designing the raft and foundations the engineers were faced with the problem of having to allow for the very greatly varying weight of the treasuries consequent upon the big fluctuation in the amount of silver stored therein as different times, and it is a striking tribute to the success of the designers that the very slight subsidence which has occurred to date has been completely uniform at all four corners.

The bronzework in the building calls for genuine admiration, in which regard the magnificent bronze entrance gates, countergrille, electric light brackets, etc., are worthy of special mention, as also the two bronze lions flanking the main entrance, which were modelled from a design by Mr. H. Poole, A.R.A.

The Venetian mosaic in the Octagonal hall was fixed by two Italians specially brought out for this work, while the whole of the marble work in the building has been matched and erected under the expert supervision of Mr. D. Collins, on the staff of the building contractors.

The Responsible Contractors

The sub-contractors employed on the building were :—

Redpath, Brown & Co.—Structural steelwork.

Wheeler & Comyn Ching—Heating, ventilating and vacuum cleaning plant.

Jenkins & Son—Marble work throughout.

Art Pavements & Decorations, Ld.—Venetian mosaic work to walls and ceiling of Octagonal Hall.

George Brown & Son—Fibrous plaster ceilings and friezes.

Luxfer Prism Co.—Top light over Banking Hall.

J. W. Singer & Sons, Ld.—Bronze entrance gates, doors, lions, etc.

W. F. Ramsay & Co.—Bronze counter-grille, electric light pendants and brackets, bronze caps and bases to marble columns, door furniture.

Hope & Sons—Bronze and steel windows throughout.

Otis Co.—Electric passenger lifts.

Chubbs & Chatwood—Treasury and strong room doors.

Chatwoods—Safe deposit fittings.

Shanks, Doulton, and Dent and Hellyer—Sanitary fittings.

Merryweather—Fire appliances.

Roneo Co.—Steel furniture.

Arts & Crafts—Joinery, manager's office.

Weeks & Co.—Joinery, manager's private office and furniture.

Felgate & Co.—Interior painting.

The Crittall Manufacturing Co., Ltd.—Wrote iron gates, internal railings and bronze work.

The steel and bronze windows have been supplied by the well known firm of Henry Hope & Sons, Ld., Birmingham, England, who are represented in Shanghai by Messrs. Duncan & Co., who have also supplied the same windows to other large buildings here.

Messrs. Caldbeck, Macgregor & Co. were responsible for the catering arrangements at the opening ceremony, and the big undertaking was attended to with the firm's usual efficiency.



The Nucleus of a Great Engineering Industry : The Taikoo Dockyard and Slipways at Hongkong

Hongkong Harbor Improvements

THE authorities of Hongkong are looking far into the future with their plans for the development of the port and its industries. Two years ago, the disclosure of the terms of the Cassel convention conceding to British interests a practical monopoly on the coal mines and transportation facilities of the province of Kwantung provided an insight into the program for the future industrial development of the colony. Later, the report on the industrial possibilities of the colony submitted by a special commission together with further information threw further light on the plans entertained for making Hongkong the leading manufacturing centre of the Far East. The recent understanding between Hongkong and Canton is another manifestation of the working of the far-sighted policy for developing the natural resources of South China and advancing the general welfare of the colony. In another article in this issue of THE FAR EASTERN REVIEW will be found a comprehensive survey of the magnificent road program of the public works department which is also looking far ahead to the requirements of a great industrial and residential centre. A new interest has now been added to the general development plans of the colony by the publication of the report of Sir Maurice Fitzmaurice on the needs of the port, the basis of Hongkong's past, present and future greatness. In line with the other great harbors of the world, Hongkong with all its wonderful natural advantages is compelled to visualize the time near at hand when vessels of 35 feet draft will use the Suez Canal. With this possibility in view, the report has been drawn up.

Without attempting to express any opinion on the merits of the scheme, it occurs to us that within ten years, or by the time the present scheme is finished, it may be necessary to make provision for still larger ships. At present, the Orient takes over one-fifth of America's trade, having doubled in the last ten years. If the same rate of increase is maintained during the next decade, larger and larger vessels will be needed until 30 to 50,000 tons leviathans will be plowing their way across the Pacific in the same manner they now traverse the Atlantic. Given ten years of stable government in China with an opportunity for safe investment in the development of her resources, the trade of this country alone will demand this increase of tonnage. However, this applies equally to all Oriental ports where the size of the ships must necessarily be subordinated to the depth of water and facilities to handle the cargoes. If the ports of the Orient are to be limited to a maximum depth of 36 feet alongside the wharves, the history of shipping on the Pacific will soon be written.

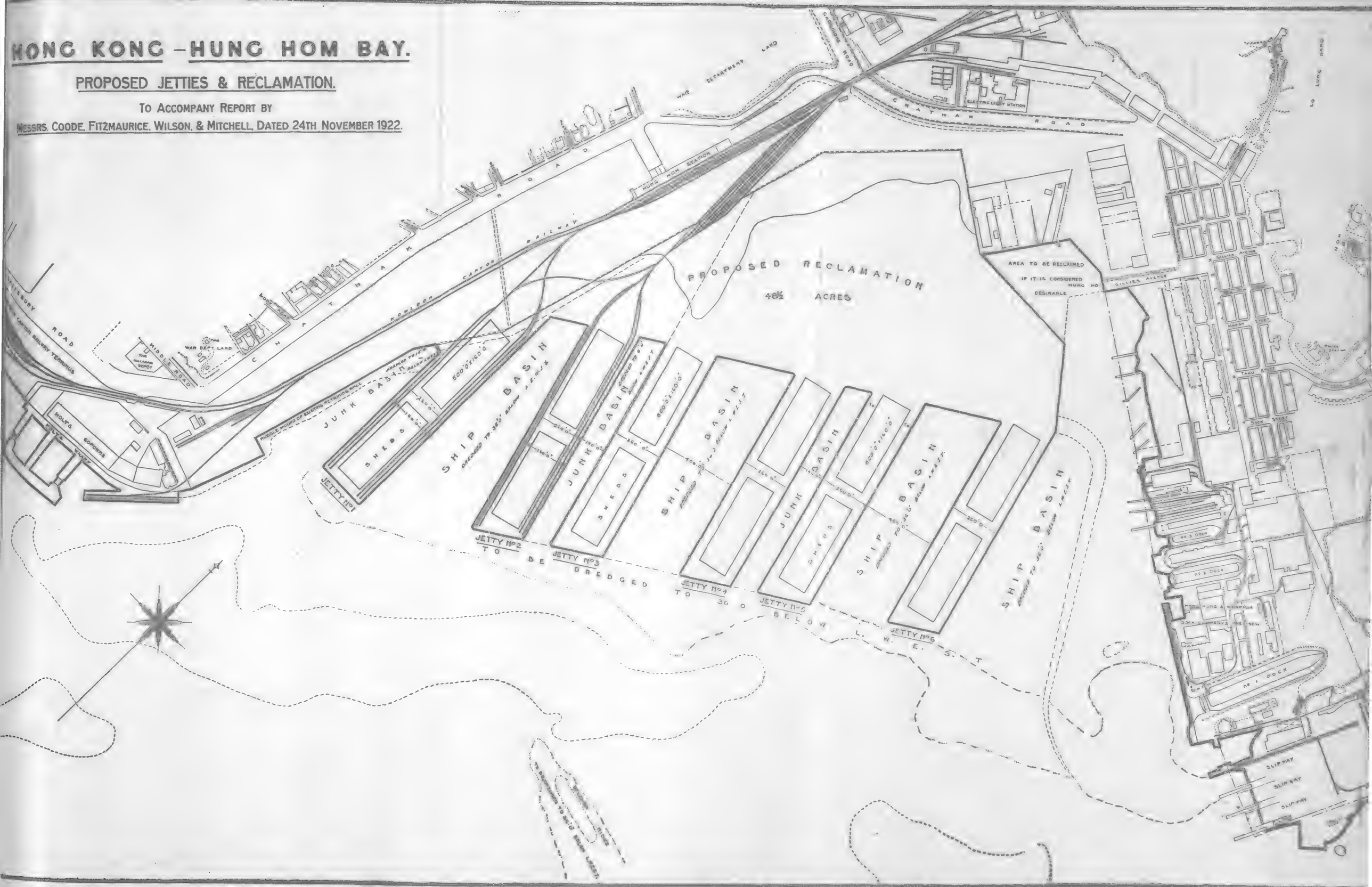
The plan for the development of the port of Hongkong looks ahead to the time when large bulk rail shipments will be made from interior Chinese points to foreign countries unloading from the cars direct into steamers at Kowloon. This visualizes the completion of the Canton-Hankow railway and other lines terminating at a deep-water outlet over the Canton-Kowloon rails to the proposed Hung Hom wharves. There is just the possibility, however, that by the time this development warrants the use of these wharves for such cargo, the port of Canton may have been improved to such an extent that it will prove a serious competitor for this business. In

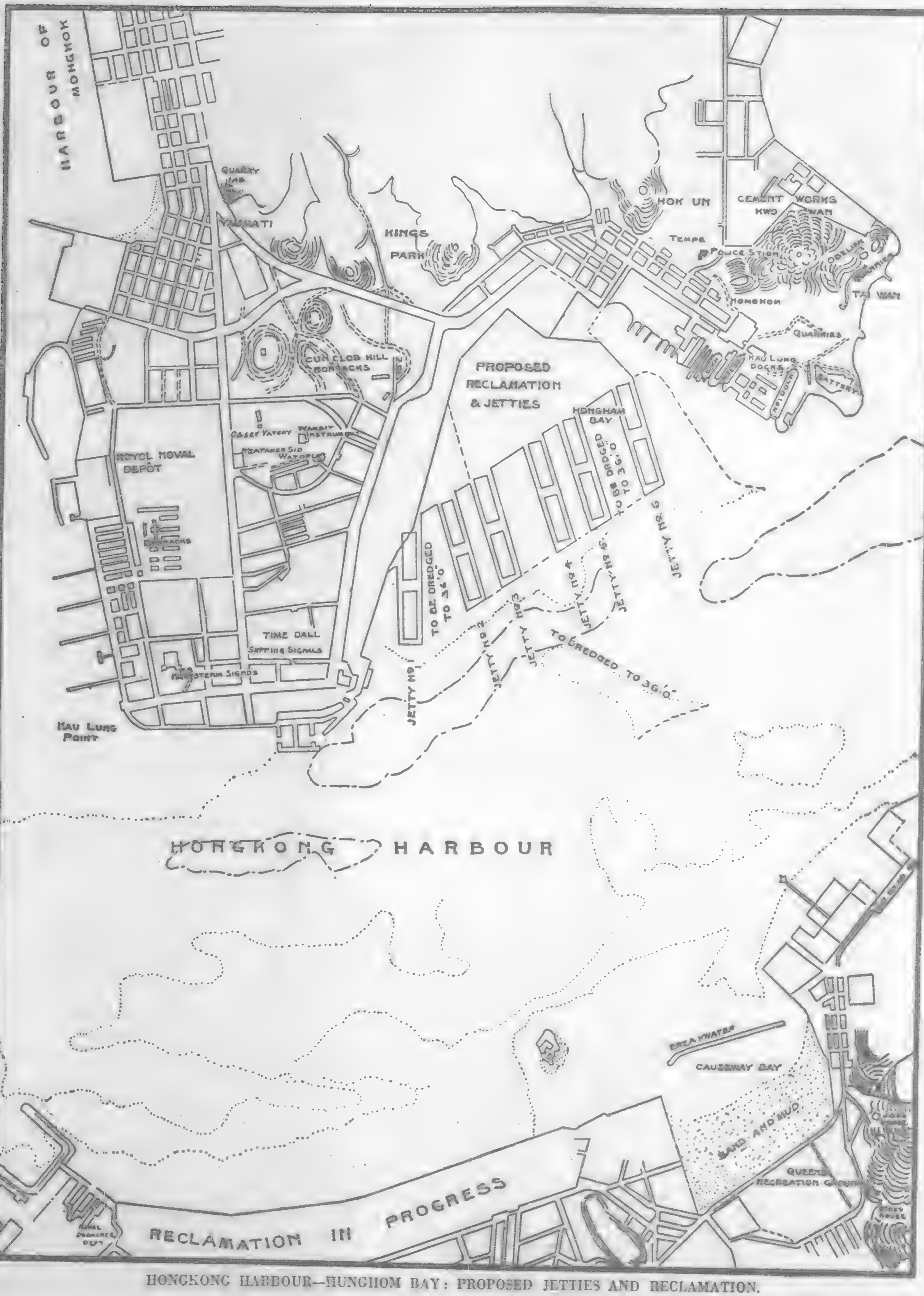
KONG KONG – HUNG HOM BAY.

PROPOSED JETTIES & RECLAMATION.

TO ACCOMPANY REPORT BY

MESSRS. COODE, FITZMAURICE, WILSON, & MITCHELL, DATED 24TH NOVEMBER 1922.


WAR DEPARTMENT LAND
CHATHAM ROAD
ELECTRIC LIGHT STATION
TO LUNG HANG
HUNG HOM STATION
KOWLOON CANTON RAILWAY
SALISBURY ROAD
KOWLOON CANTON RAILWAY TERMINUS
MIDDLE ROAD
WAR DEPT. LAND
THE GALLOPS DEPOT
HOLT'S WHARF
EASTERN WHARF
RUBBLE MOUND OF EXISTING RETAINING WALL
JUNK BASIN
SHED
JETTY No 1
SHIP BASIN
JETTY No 2
JETTY No 3
JUNK BASIN
SHED
SHIP BASIN
JETTY No 4
JUNK BASIN
SHED
SHIP BASIN
JETTY No 5
SHIP BASIN
JETTY No 6
PROPOSED RECLAMATION
48½ ACRES
AREA TO BE RECLAIMED IF IT IS CONSIDERED HUNG HO DESIRABLE
GILLIES AVENUE
MARSH STREET
TAKU STREET
DOCK STREET
POLICE STATION
No 3 DOCK
No 2 DOCK
HONG KONG & WHAMPOA DOCK COMPANY'S PREMISES
No 1 DOCK
SLIP WAY
SLIP WAY
SLIP WAY
JETTY No 2 TO BE DREDGED TO 36 0 BELOW L.W.E.S.T.
JETTY No 3 TO BE DREDGED TO 36 0 BELOW L.W.E.S.T.
JETTY No 4 TO BE DREDGED TO 36 0 BELOW L.W.E.S.T.
JETTY No 5 TO BE DREDGED TO 36 0 BELOW L.W.E.S.T.
JETTY No 6 TO BE DREDGED TO 36 0 BELOW L.W.E.S.T.
SHIP BASIN GROUND TO 36 0 BELOW L.W.E.S.T.
SHIP BASIN GROUND TO 36 0 BELOW L.W.E.S.T.
SHIP BASIN GROUND TO 36 0 BELOW L.W.E.S.T.
SHIP BASIN GROUND TO 36 0 BELOW L.W.E.S.T.
JUNK BASIN GROUND TO 36 0 BELOW L.W.E.S.T.
JUNK BASIN GROUND TO 36 0 BELOW L.W.E.S.T.
500'0'x160'0"
500'0'x160'0"
600'0'x160'0"
600'0'x160'0"
260'0"
260'0"
260



HONGKONG HARBOUR—HUNGHOM BAY: PROPOSED JETTIES AND RECLAMATION.



Royal Naval Station at Hongkong



River and Coastwise Steamer Wharves, Hongkong

fact, if Dr. Sun Yat-sen can raise the funds, the time must arrive when Hongkong must face the competition of a port at Canton, and although this may never affect the importance of Hongkong as a distributing centre it would certainly take away much of its importance as a point of bulk shipments from the interior.

The consulting engineers have devised a scheme which would afford at an early date a certain amount of berthage for large vessels and junks and which would admit of future extension as the trade of the port required. "For the complete scheme we propose to construct in the bight of Hung Hom Bay a large reclamation of about 48 acres, from which will project in a southerly direction a series of six jetties." For the first instalment the construction of two jetties is proposed, together with a portion of the reclamation to the extent of seven acres. The estimated cost of this first instalment is £1,260,000.

The salient features of the report are covered by the following excerpts :—

Designs Based on two Propositions

There is nothing in connection with tides and currents which can cause any difficulties to ships coming alongside or leaving the wharves proposed by us, and in fact such conditions are much better than in many ports with which we are acquainted. Until our visits to Hongkong we were a little uncertain as regards the conditions existing in the harbor due to wind during typhoons and other periods. From a careful examination of all data and evidence obtainable, we are satisfied as regards the following two propositions :—

(*a*) Whatever works may be constructed, ships must get into the open away from wharves during typhoons.

(*b*) Except during typhoons, ships can at all times lie with safety at wharves in any part of the harbor.

Our designs are based on these two propositions.

The Requirements of the Harbor Trade

The special requirements of the trade as at present conducted in regard to the large proportion of cargo which is taken away by junks and barges, has already been referred to in this report and is dealt with in these proposals by providing in the case of each jetty (with one exception to be referred to later) deep-water berthage for large vessels on the one side and berthage for junks or vessels of small draft on the other. By this arrangement cargo which has been placed in shed either for sorting or warehousing can be loaded with equal convenience into ship or junk as the case may be. There will also be no difficulty if necessary in transferring directly from ship to junk or junk to ship.

It will be seen that, to meet these conditions, we propose to provide on the western side of Jetty No. 1 a junk basin having berthage of about 850 feet in length. This and the other junk basins shown will, where necessary, be dredged to give a minimum depth of 15 feet below extreme low water spring tides, which from the information obtained appears to us to be amply sufficient. Portions of the basin, depending upon the natural depth of the water, will be of greater depth.

The eastward side of Jetty No. 1 will be provided with a quay 1,400 feet in length, having a depth of water of 37 feet below Hongkong ordinance datum (*i.e.*, low water ordinary spring tides) or 36 feet below extreme low water level. This depth, for the reasons already given, will in our opinion be amply sufficient for all purposes.

Jetty No. 2 is provided on its western side with a deep-water quay 1,200 feet in length, and on its eastern side with a quay for junks of the same length. The ship basin provided between the deep-water quays of the Jetties Nos. 1 and 2 will be dredged to a depth the same as that alongside the quays, viz., 36 feet below extreme low water level. This dredging will be continued seaward until it reaches the 36 feet contour line as shown on the drawings.

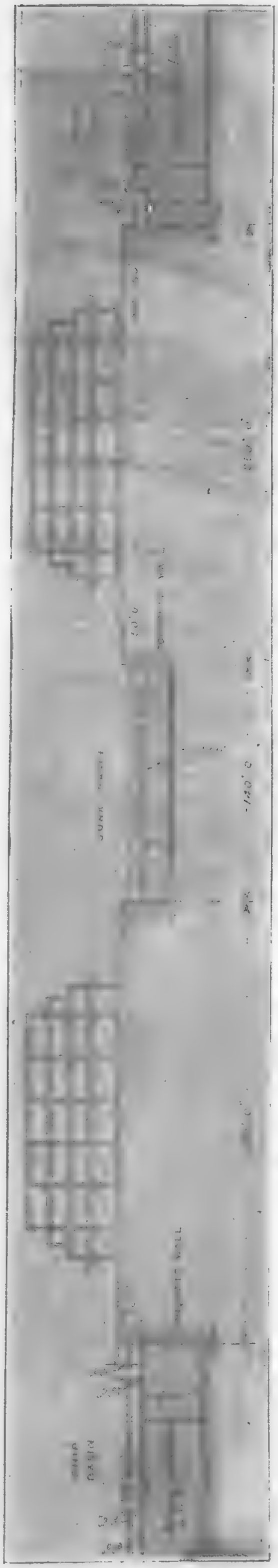
The first instalment of the complete scheme will provide, 2,600-in. feet of deep water quays, giving accommodation for say five of six large steamers of varying dimensions, and 2,050 lin. feet of quay for junks and vessels of light draft.

The width of the jetties is 260 feet, which will provide space for the construction in each jetty of two sheds or warehouses lay 500 feet in length and 160 feet in width. This will allow a width of 50 feet on each side of the sheds between the latter and the quay face. This in our opinion will be amply sufficient for the convenient handling of cargo between the vessels and the sheds but is by no means excessive. This width also permits of two lines of railways and crane road, which could be laid as and when required. If cranes of the portal type be adopted, a third line of railway could be provided on the quay. In addition to these, a line of railway could readily be taken into the sheds or warehouses themselves should such a course be considered advisable.

Type of Warehouses

The type of warehouses to be erected is a matter which will require careful consideration. It may be, as already suggested in this report, that these will be erected by the shipping or godown companies. If so, they will probably be upon the lines of the very excellent warehouses recently erected by Messrs. Holt and the Hongkong and Kowloon Wharf and Godown Co. We have, therefore, not gone into this matter in detail but in Drawing No. 4 have merely shown an outline of a typical four-storied shed placed as above described so as to provide a width of quay of 50 feet on either side. Whatever arrangements may be made as regards the construction of the sheds or warehouses themselves, we would strongly recommend that the government should lay down certain rules and regulations with regard to the arrangement of the ground plan so that the required width of quay surface and proper and easy access thereto both for road and railway traffic may be maintained.

Questions in connection wish the manner of dealing with the cargo in and out of vessels have not been dealt with in this report, but it it be decided to proceed with the work, they will require to be carefully considered. At the port of London, and in many other ports, cranes on high carriages so that they can reach over the sides



Hongkong-Hung Hom Bay : Proposed Jetties and Reclamation : Typical Cross Section of Jetties

of the largest vessels, are frequently provided. Such cranes at Hongkong, where violent typhoons are experienced, would probably be unsafe and it might be preferred that cargo should be placed on the quay by ships' derricks, being afterwards lifted into the upper floors of the sheds by cranes having comparatively low carriages, running alone the quay. All such matters of equipment will have to be fully considered when the time comes.

The Reclamation

The ground in the vicinity of Kowloon is extremely hilly, and extensive levelling has been done in the district to provide building areas for the increasing population. We would propose, therefore, that the general filling both for the reclamation area and for jetties, be obtained from levelling down high ground in the vicinity. Such procedure would have the double advantage of supplying material more suitable for the purpose than dredgings, and of providing areas of remunerative value for building sites which would be a set off against the general cost of the works. This is a question which would, of course, require careful local consideration, and before any contract was entered into for the construction of the works, the sites from and conditions under which such material could be obtained should be clearly laid down.

With regard to Belcher Ridge, we would propose to dredge down to 36 feet below extreme low water over the area crossed by red lines on the drawings, that is to remove the portion protruding northwards of the general line of the 6-fathom contour as given on the admiralty chart. It will be seen that we also propose in connection with the first instalment of the works, to remove the cust rocks down to the same level, so as to give a perfectly clear access to the jetties, free from any obstruction.

The Estimates

In estimating the cost of the works we have kept in view the local prices furnished to Mr. Wilson on the occasion of his visit last February, making allowances for the differences in the character of the work, and of the methods and appliances required for their execution, as compared with those to which the local prices actually applied. We have also assumed that material above the lines on the drawings forwarded to us, described as "hard as derived from prickings" can be removed by direct dredging by a bucket dredger without recourse to blasting. Keeping these points in view we estimate the cost of the first instalment of the works as shown by red color on the drawings at approximately :—

Jetties Nos. 1 and 2, including filling ..	£1,120,000
Reclamation and dredging in connection with jetties	98,000
Dredging Belcher Ridge	13,000
Dredging Cust Rocks	29,000
	£1,260,000

The above estimate includes 10 per cent. for contingencies but does not cover the following items :—

(1) Warehouses which we have already referred to.
(2) Railways, which we presume would be dealt with by the railway department.
(3) Crane equipment, which will depend upon the method of dealing with cargo which may ultimately be decided upon. Assuming, however, that in the first instance four 3-ton cranes were to be provided on each of the four quays, the approximate cost at present prices would be about £60,000.
(4) Electric power and lighting, with cables and wiring, which we presume would be dealt with locally.
(5) Water supply, which would also no doubt be dealt with locally.
(6) Acquisition of land from which to obtain filling, or for other purposes.

Although we have not included the provision of pipes for oil bunkering purposes along the jetties, our proposals will not interfere with laying such pipes in the future if and when the oil companies wish to provide a supply of bunker oil to ships lying alongside.

We estimate the time required for completing the whole of the works included in the first instalment at about 3½ years.

With regard to the actual execution of the work, we would strongly recommend that the course which has been satisfactorily adopted in connection with large works carried out under our direction for your department in the Straits Settlements. Federated Malay States, Kenya Colony and Nigeria, be adopted, and a contract for the works entered into, tenders being invited in the usual way from responsible British contractors with experience in carrying out large marine works of this character. Such a course has many advantages.

Future Extension

The works recommended for future extension would be generally similar to that already described in connection with the first instalment. and the jetties could be carried out as and when required. When completed there will be available 8,600 lin. feet of deep-water quay, or say 18 to 20 berths for large vessels of varying dimensions and 5,650 lin. feet of shallow quay for junks and barges, without taking into account the quay at the eastern end of the reclamation colored yellow.

Systematic Observations of the Harbor Needed

The report says :—

We have been unable to find that any systematic observations have been made at regular intervals of the depth of water in different parts of the harbor. It is of great importance in every harbor that a proper and complete history of the changes which occur from time to time should be available.

Hongkong has an area of sheltered water so large and so deep that in all probability it has not been considered necessary up to the present time to keep such records as are essential in other harbors which have not got the same natural facilities. On the other hand the possession of such a magnificent harbor is just the reason why everything possible should be done to prevent any deterioration in its condition.

As far as we have been able to ascertain there is not much sign of shoaling between the Lye Mun entrance and a north and south line through the observatory, except in some sheltered bays. We have, however, not got the same confidence as regards the area of the harbor to the west of this line.

On May 12, 1905, our firm reported to you on shoaling in the harbor. In that report we considered certain investigations as regards shoaling made by the late Mr. Boulton in 1904. We went into this question very fully, obtained much information from the admiralty on the subject, and came to the conclusion that the amount of shoaling was much less than was suggested by Mr. Boulton, but stated that " it is of great importance that the question which has been raised with regard to the silting should be carefully considered and thoroughly invesligated," and proposed that a very complete survey of certain portions of the harbor should be carried out.

As far as we know the recommendations then made have not been carried out, and we consider that no further delay should occur in making a systematic survey of the portion of the harbor to the west of the north and south line through the observatory. This survey should be made on standard lines so that all soundings and other observations can be reported on the same lines from time to time.

The report is concluded by the following paragraphs :—

We have given consideration to the provision of better facilities for traffic between Hongkong and the mainland, particularly for vehicular traffic. The only feasible method without great expenditure of money is the provision of ferry boats. There are numbers of these in existence at the present time. Some of the most important are those crossing the Thames, the Mersey, the Clyde, New York harbor and San Francisco harbor.

These ferry boats carry very large numbers of both horse and mechanical vehicles. That on the Thames at Woolwich is under the control of the London county council and is looked upon in the same way as a bridge over the Thames or a tunnel underneath and no charge is made for either vehicles or passengers. It in fact takes the place of a road. On the Mersey there are several ferry services controlled by the Birkenhead Corporation and the Wallasey Corporation and a charge is made both for vehicles and passengers.

We consider the cross traffic between Hongkong and Kowloon is growing sufficiently to warrant the provision by the government of a good vehicular and passenger ferry service.

* * *

Harnessing the Sun's Rays

DR. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, one of the formost inventors of the day, is looking ahead to that time in the future when the coal supply will be exhausted and all the water powers developed, when the babbling brook and the roaring cataract will be gone, and sluggish pools extend from powerhouse to powerhouse, to feed the power demand of an ever increasing population. Will our civilization, he asks, come to a standstill for lack of further energy supply, and then begin to decay, because there is no standstill in nature ? Or what other energy supply can be opened up ? Oil and natural gas will long have vanished ; indeed, they will be the first to go. Wind and tides and wave power may be used as far as possible, but their total is so insignificant that it does not come into consideration. There is only one other source of energy left, and that is the energy of the sunlight, but this is the greatest of all the energies—though we have no economical means yet to utilize it. The amount of energy of the sunlight falling on the uninhabited and uninhabitable regions of our country, the deserts, is over two hundred thousand millions of horse-power, thousands of times larger than all the water power and all the power we now get from coal. So this is the problem for the engineers of the future—to harness the energy of sunlight, this accomplished, there will never be any more lack of energy.

In reality, the energy which we use to-day is the energy of the sunlight. The heat of the sun's rays evaporates the water, the water vapor rises to the clouds, condenses and comes down as rain feeding the rivers which give us the water power, and thus the energy which raised the water and which we get from the water power plant, is the energy of present day sunlight. When we burn coal, it is again the energy of sunlight we use, but from the rays of the sun millions of years ago on the primeval forests of the Carboniferous period, when the earth was still younger. Then the plants stored the energy of the sun's rays in their wooden structure, and the wood turned to coal through the ages, and we are using up in a few centuries the energy of the sunlight which nature has stored through millions of years in the coal mines.

The end of the era of gas and gasolene is in sight unless new and important fields are discovered, and to-day the nations endowed so by nature are harnessing their water powers to meet the demand for power and save their coal. Japan is forging ahead in this respect, taking the lead in the creation of huge super power zones and electrifying her industries and railways. With an available 13,000,000 horse-power in her rivers relasing about 130,000,000 tons of coal she, will, in time, solve her present fuel shortage.

The United States uses 50 million horse-power for power purposes. Of this amount, exclusive of that used by railroads, 40 million horse-power is produced by steam, and 10 million by water power. Undeveloped water power could produce 30 million horse-power and the entire potential horse-power Dr. Steinmetz estimates at 300 million.

The 10 million horse-power developed by water power in America at present saves the consumption of 100 million tons of coal. The industries and public utilities of the United States now use about 230 million tons of coal, railroads 160 million tons, 110 millions are used for heating purposes, and 110 millions more for miscellaneous uses.. Thus, if the 50 million horse-power potent in now undeveloped water power were utilized, Dr. Steinmetz says, it would result in the saving of some 500 million tons of coal, or more than all that is now used by the industries and railroads in the United States, with some to spare.

Power Standardisation in Japan

THE Japanese imperial department of communications has been working on a plan for standardising the electric-power supply, with the object of cutting cost and increasing the actual supply. Fundamental to the plan, Japan needs to standardise the cycles used. The number of cycles now general for transmission in Japan varies considerably, from 25 to 100, including 30, 40, 50, 60 and 80. However, the number is gradually becoming standardised at 50-60. Classifying the electric power enterprises in Japan according to the number of cycles, the following is obtained :—

Districts	*Cycles.*	*Kilowatts*	*No. of Enterprises*
Kwanto	.. 50	158,669	45
	60	11,111	6
	Others	20,543	4
Osaka and Nagoya ..	.. 50	38,442	71
	60	338,219	112
	Others	10,912	4
Chugoku	.. 50	5,011	9
	60	37,921	26
	Others	0	0
Shikoku	.. 50	3,153	10
	60	20,369	13
	Others	537	1
Kyushu	.. 50	63,450	30
	60	86,020	23
	Others	0	0
Tohoku	.. 50	27,090	67
	60	73,288	37
	Others	0	0
Hokkaido	.. 50	20,501	31
	60	38,138	15
	Others	0	0
All Japan	.. 50	316,321	263
	60	605,066	232
	Others	331,993	9
Total		1,253,380	504

By using converters, the standardisation can easily be accomplished, although a loss of more than 10 per cent. is caused in conversion, and it not only affects profits, but requires a change in the motor, generator, transformer, electric-motors, etc. The question of standardisation of transmission was discussed in the Diet this year, and the imperial department of communications is making a study of the question.

Taikoo Builds Turbines

The Engineering Future of Hongkong

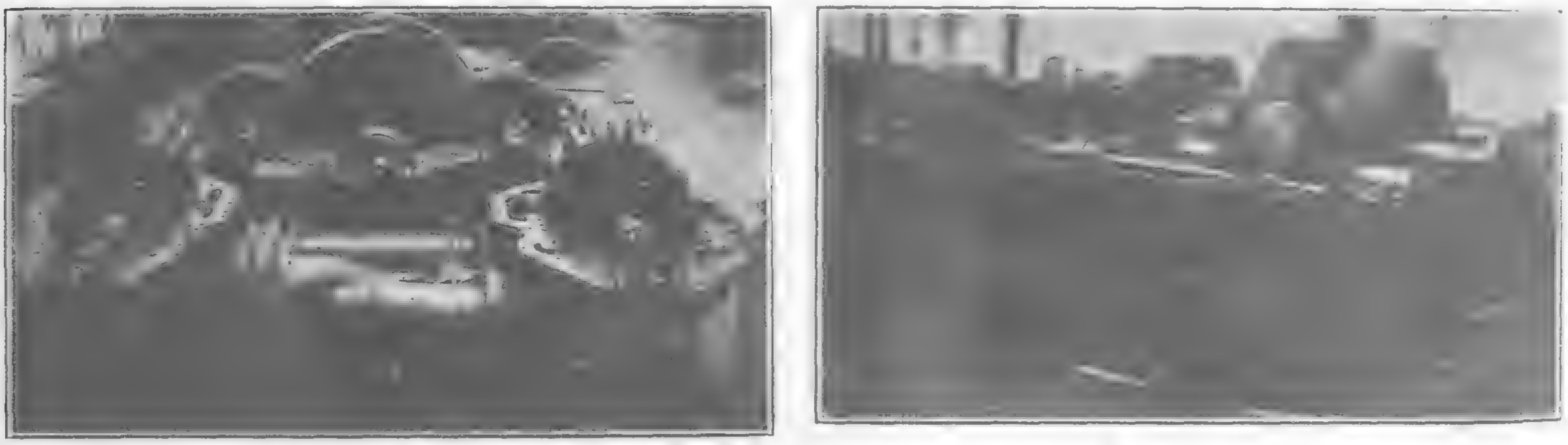
THE success of Dr. Sun Yat-sen in establishing liberal rule in the province of Kwantung, brings so much nearer the day when co-operation with Hongkong will bring with it practical results towards the expansion of engineering industries in that colony. As pointed out in previous editorial articles in this magazine, the one thing essential to the development of Hongkong into a great manufacturing centre is cheap coal, which can come only from opening the mines in the neighboring province of Kwantung. With an unlimited supply of cheap labor drawn from the Chinese provinces, coupled with a supply of cheap coal from the same sources, Hongkong in a few years would become one of the largest manufacturing centres of the world. This might also be true of other parts of China were conditions different, but Hongkong has one advantage over Shanghai, Hankow or other important Chinese centres. There is law and order, security and guarantees in Hongkong for capital which do not exist in other parts of China, and this, for some years to come, will be the determining factor in any large scheme for industrial development. In the eighty-one years of its existence, Hongkong has grown from a pirate's headquarters into the largest port in the world, its population increasing from 5,000 in 1842 to nearly 700,000 in 1922. With cheap coal and the stimulus this will give to industrial enterprise in all lines, the population should in a few years reach 5,000,000. Nothing can then prevent the growth of enormous steel works and allied industries, which will produce machinery at a price that will defy competition from Europe, America or Japan.

The basis for these engineering enterprises already exist in the great dockyards of the Hongkong & Whampoa Dock Company, The Taikoo Dockyard and Engineering Company, W. S. Bailey & Company and several minor European and Chinese engineering concerns. The first two companies are equipped to build the largest steamers and the most modern machinery, while the last handles the smaller business and is now preparing to build its own drydock. All of these enterprises have been at various times fully described in past issues of THE FAR EASTERN REVIEW.

As an indication of the importance of these shipbuilding works, we give prominence to a set of illustrations showing the construction of geared turbines made by the Taikoo Dockyard and Engineering Works, Ltd., for the s.s. *Kaying* built at the works last year. The vessel has a gross tonnage of 2,626 tons, with a length of 321 feet, beam, 44 feet, depth moulded, 23 feet, and was built to the order of the China Navigation Co., Ltd. for their Bangkok trade. It has two decks, a long combined poop and top gallant forecastle. Accommodation is provided on bridge deck amidships for the officers, engineers and first-class passengers. Cabin accommodation is also provided at the after-end of the upper deck. The 'tween decks have also been made suitable for carrying passengers. The cargo gear consists of eight steam winches and derricks capable of dealing with weights up to 30 tons. The steam steering gear is of the "Wilson Pirrie" type, fitted in house aft and controlled from amidships by telemotor gear. The cellular double bottom is constructed for the carriage of oil fuel, if required, and the fore and after peaks can be used as trimming tanks. The propelling machinery consists of a set of "Brown-Curtis" type of turbines, built by The Taikoo Dockyard & Engineering Co. of Hongkong, Ltd., comprising H.P. and L.P. turbines, combined with astern turbines, driving a single propeller through double reduction gear, capable of maintaining a total combined shaft horse-power of 1,600 on ordinary sea service, with the turbines running at 3,500 revolutions per minute and propeller at 102 revolutions per minute. This machinery is supplied with superheated steam from one large multitubular marine boiler at a working pressure of 200-lbs. per square inch. The boiler is fitted so that either coal or fuel oil can be used for generating steam under forced draught on the "Howden" system. The vessel is also fitted with a "Cochran" donkey boiler and the latest auxiliary machinery, and is lighted by electricity throughout.



Turbines Steamer "Kaying" built at Taikoo Dockyard



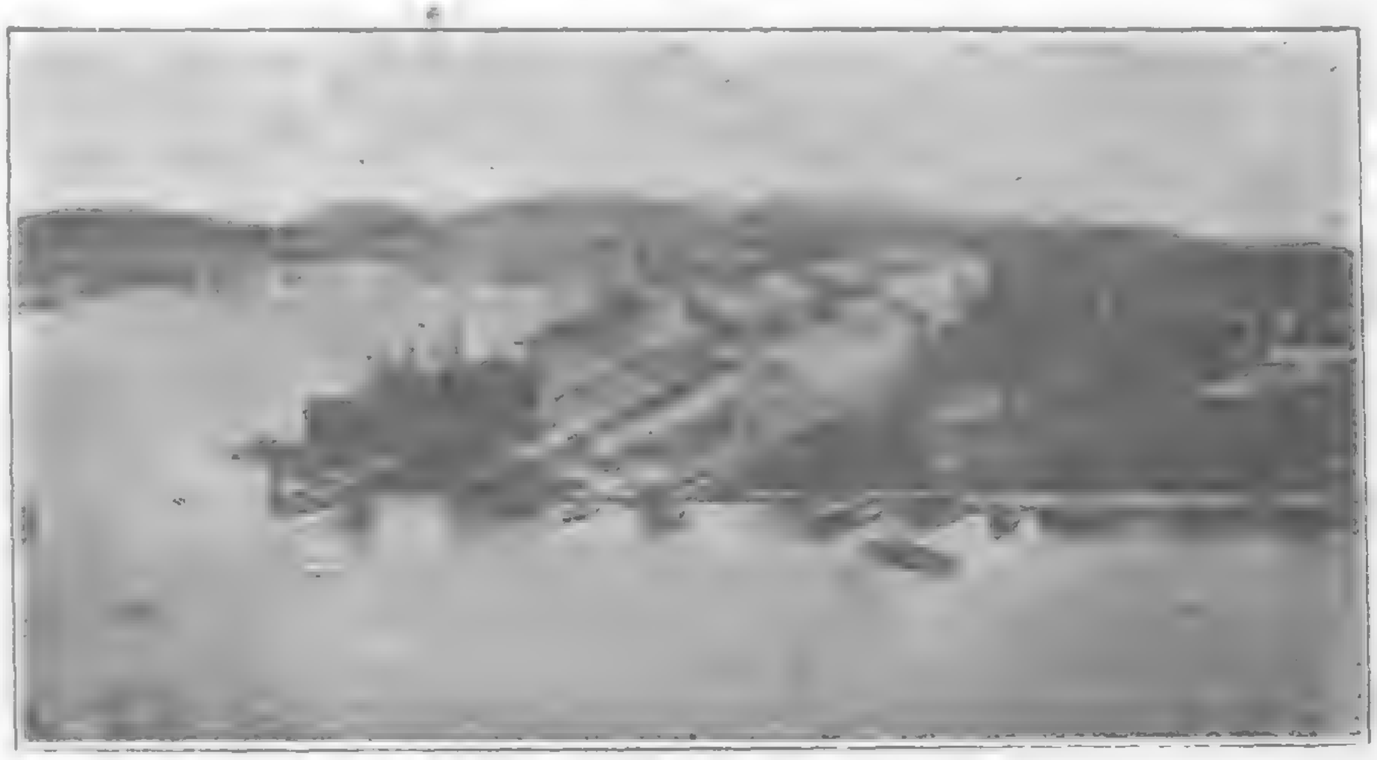
General Turbines for the s.s. "Kaying" built by the Taikoo Dockyard and Engineering Works, Ltd., of Hongkong

The Promising Coal Fields of Taiwan

THE Japanese government promulgated mining regulations for Taiwan in 1896, and ordered an official survey of the coal fields in the northern part of the island to be made. During the decade following mining progress was exceedingly slow, only about 100,000 tons a year being mined at the best. After the Russo-Japanese war, however, the prosperity of Japan, and the opening of mine fields previously reserved for the navy resulted in a general development of coal mines or Taiwan, and by 1912, the output was increased to 300,000 tons. The mining methods were very primitive, and the product could not compare with either the Japanese or the Chinese coals. The demand caused by the European war increased the output to more than 1,000,000 tons. Japanese capital was now for the first time invested in the Taiwan coal fields, the Keelung Coal Mining Co., the Taiwan Coal Mining Co., and others of sound standing being established, with modern equipment and the output marketed throughout the Far East.

Exports were confined to Hongkong, Canton, and Amoy reaching 230,000 tons in 1918.

Since 1919, the exports to the above ports have increased and new markets found in Shanghai, Manila and Singapore. In 1921 exports to Hongkong and Canton exceeded 430,000 tons. This record was maintained in 1922, while in the same year over 200,000 tons were shipped to Japan proper. Production in 1922 amounted to 1,250,000 tons, while the export was greater by about 50,000 tons. The following table shows the production and export of Taiwan coal to foreign countries and to Japan proper since 1912:—



General View of the Port of Keelung: A Coal Handling Wharf is being constructed to handle 800,000 tons a year.

Years	*Production*	*Exports*
1912	276,240	285,593 tons
1913	319,371	326,231
1914	342,787	369,078
1915	379,268	384,932
1916	517,581	452,693
1917	673,008	645,636
1918	757,497	669,641
1919	1,078,589	1,090,202
1920	1,088,652	1,117,391
1921	994,125	1,034,875
1922	1,246,115	1,311,973

The coal fields of Taiwan extend from Keelung in the north to the Mt. Ari region in the south. Fine coal is mined in the north around Keelung, and towards the south the quality gets less fine. The principal coal fields in Taiwan are the Shikyakutei and the Mokuzan seams, the first having a width of 3 feet of excellent quality and graded as the best of all Taiwan coal. The second seam is 1.2 to 2-ft. wide but its quality of the coal is lower than the output of the Shikyakutei.

A recent survey estimated the amount of coal in Taiwan at 690,000,000 tons, of which 460,000,000 tons can be mined. Excluding the coal already mined, amounting to about 8,000,000 tons, there remain about 452,000,000 tons potentially available. Estimating the output at about 2,000,000 tons per annum, there are supplies available for another 220 years. The estimated reserves of coal in the Taiwan fields will stand comparison with that of the Fushun Mines in Manchuria. In addition to these potential resources, there are several districts in the savage regions where surveys have not yet been made.

It is generally taken for granted that Taiwan coal is poor in quality. This is a mistake. The primitive method of mining and careless grading are mainly responsible for this idea. When the Taiwan government sent Ryoko and Kinhori coal from the Shinkyakutei seams to the Kure Naval Arsenal in June, 1918, it were graded as "second," and used for fuel in battleships. The dust coal of the same mines passed the tests as "third," and recommended for factory use.

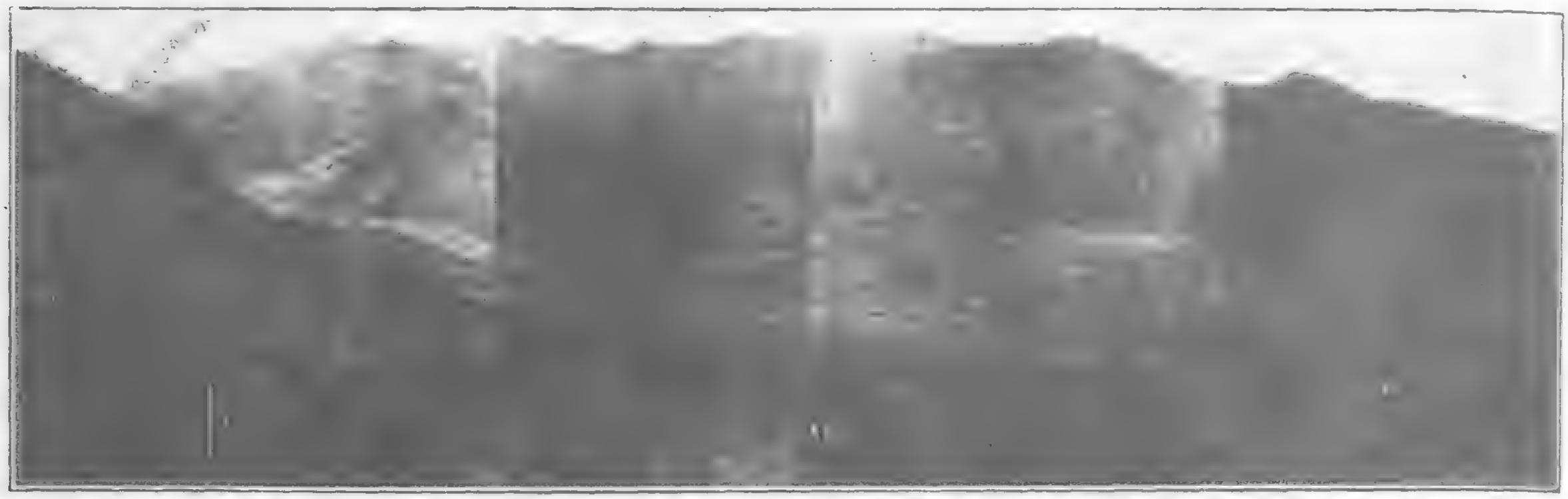
The recent expansion in the demand for Taiwan coal in the markets of the Far East is due to the efforts of the dealers, and to its good quality. Taiwan holds an excellent geographical position and its output can compete with the best Japanese Fushun and Kaiping coals in the matter of freights and deliveries. The mines are located not more than two to ten miles away from shipping ports making for low shipping costs.

The Keelung Coal Mine Co. has installed a grading machine with a daily capacity of 1,000 tons at Kokan station on the Zuiho Railway line, near the port of Keelung. Other mines are using women workers for coal grading, and the reputation of Taiwan coal is rapidly increasing.

The port of Keelung is being modernized. Its present capacity is two steamers outside the port, and 15 inside, a total of 17. It has no mechanical equipment for coal handling, which is done exclusively by coolie labor. The total capacity for cargo handling in Keelung is 2,000 tons of fuel, and 3,000 tons of cargo a day. A quay for the exclusive handling of coal is now under construction at Gyochu in the western part of Keelung Bay, and when completed it will be possible to handle 800,000 tons of coal a year there, and when the railway system is improved this can be increased to 1,000,000 tons.

The future of Taiwan coal is, therefore, promising. Foreign steamers coming to the Far East have always obtained coal in Hongkong, Manila, or Singapore. It is very rare that coal at Keelung. But in years the amount of coal supplied to foreign vessels has steadily increased. In 1918, only 400 tons of bunker coal was supplied, in 1919, 11,000 tons, and in 1920, the total reached 24,000 tons. This fell off to 8,000 tons in 1921, and climbed up again in 1922 to 13,000 tons. Because of poor port accommodation it is impossible to attract all steamers to Keelung for coaling, but it is hoped that in time at least half of the bunkering done at Hongkong amounting to 200,000 tons a year may be deflected to Keelung.

Japanese privately-owned steamers plying to the South Seas all coal at Keelung on their home voyages. The Toyo Kisen Kaisha South Sea line also commenced coaling at Keelung last year. These steamers require only a half day, or at least a few hours to put into Keelung, and with Japanese first grade bunker coal at Y.20 in Hongkong, and Taiwan coal at Keelung Y.14, there is a saving of Y.6 a ton. The total handling quay will be completed by the end of 1924. Thereafter Keelung should become a coal trade centre of the Orient.



Panoramic view of the hills to the south of Linglungshan mountain together with the southern end of the outcrops of one of the principal fissure veins in the Linglungshan region. Looking east-northeast

Gold Ore Deposits of the Linglungshan Region, Tsaoyüen, Shantung—2

By Y. Tsenshan Wang

(*Continued from page 389*)

ORE dressing.—The treatment and sorting of the ore at these mines is simple but very unscientific. The general occurrence of chalcopyrite and pyrite, particularly where the former appears to have decomposed in cracks or on open surfaces in the quartz veins, forms the principle upon which the sorting and separation of the ore is based. The presence of chalcopyrite and sometimes of the native copper disseminated in the quartz, is invariably much richer than the veins carrying both chalcopyrite and pyrite or the latter alone, and the separation of the two classes of ore becomes of importance.

1st step: The ore is carried down from mines in baskets by the Company's own men to the "ore dressing room." The ore is separated into classes, and is broken on a hard rock with hammers into pieces 2 c.m. square.

2nd step: The broken pieces are then transfered to a stone grinder, upon which was placed a stone roller of 40-50 c.m. in diameter and about 70 c.m. in length. By means of ropes attaching to both ends of the stone roller, it is pulled around upon the grinder by a mule. In the grinding house, the floor is not covered in any way, so the loss or waste of the powdered ore must be astonishingly great. After the ore has been pulverized, it is transferred to boxes and conveyed to the milling plant which lies just on the other side of the main buildings of the Company.

3rd step: The ore is then mixed with water and the wet material is placed on a board 6 feet long and 3 feet wide, inclined at an angle 10°-14°. This may be called a true cradle. A man sitting at the upper end of the cradle is equipped with a long handle wooden claw, which he moves up and down by hand, much water being added from time to time. By this device the powdered ore is washed and sorted, the sulphides including a great deal of gold and other admixtures, falling into the narrow tanks or sinks placed at the lower end of the cradle, while the gold mixed with much sulphides, iron oxides and silica, are allowed to accumulate at the higher end of the cradle, where it has been carried by the moving up and down of the claw. The fine wet products from the sinks are again ground on a smaller stone grinder which is moved around by two or more men. The finer products from this second grinding are again worked on the cradle and the gold together with some other materials, is separated in the manner described. The fine materials in the sinks may be re-worked in that way for several times, but in general the process is not repeated more than three times, this being usually decided by the amount of gold sorted out in a preceding operation. If the amount of gold obtained from the second or third operation, is very small, the material is sold to the near-by farmers at a price of 100 coppers per 100 catties in a partially dry condition.



The cradles upon which the gold is washed and separated in the manner as described in the text. In the backgound shows the northern limit of the Linglungshan Summit. Looking west

4th step: The auriferous material accumulated at the upper end of the cradle at each time, is treated in a pan with water whatever amount of gold may be there being panned out. The gold obtained in this way is said to have 85-90 per cent. pure, the other admixtures, iron oxides and silicate, constitute about 15 per cent. or 10 per cent.

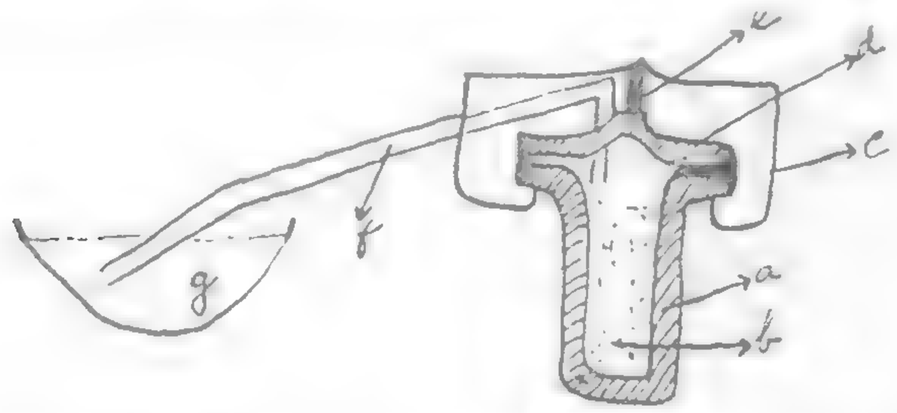
The separation of gold from the powdered ore is also effected in another way. The powdered ore from the first grinding is mixed with water and the wet material is washed in a dish 8 inches in diameter and 3 inches deep perforated in the bottom with numerous minute holes. The dish is held in the hand over the amalgamation table and under a small stream of water. The water and the powdered ore are allowed to discharge

through these minute holes and the gold is caught by mercurry on the amalgamation table which is about 10 feet long and 2 feet wide inclining at an angle of 25°. The mercurry is added from time to time and the run-offs from the amalgamation table are arrested in a sink at the lower end of the table. These run-offs are re-worked in largely accordance with the desire of the proprieter. In short, gold extraction in all cases, is lamentably low, due largely to inefficiency and lack of proper knowledge in dealing with this free milling-gold ore.

The amalgam is dried by squeezing several times in a soft sheep skin and when enough is obtained, the mercurry is distilled off.

Distillation and Smelting

Distillation.—The amalgam is placed in an iron vessel which is 1 c.m. thick with an outside diameter of 9 c.m. and inside diameter of 7 c.m. The inside depth is 16 c.m. The top is fitted with an iron cover which is perforated with a hole to which is fitted with an iron tube a little less than 1 c.m. in diameter and about 2 feet long, bent at right angle at the upper and slightly at the lower end. The iron cover is fastened on the vessel by means of a hook and a little bar, all of which are made of iron, the bar being placed in the middle between the hook and the cover (see the following diagram):—



Smelting.—The product extracted by the panning process is more or less mixed with some iron oxides and silica, and probably with some sulphide of iron, too. It is first dried and is then placed in a sand crucible without the addition of extra flux. The charged crucible is then placed in a Chinese blacksmith's furnace and is heated by means of an "air blower." By this way of heating, the entire contents is soon melted into a regular metallic bath, in which the undesirable part, principally in form of iron silicate, is concentrated on top of the bath, and the gold collects at the bottom. At this stage, the top portion or the iron silicate is poured off and the gold is poured into an iron mold and allowed to solidify. The gold obtained in this way is said to be 90-95 per cent. pure.

The Cost of Mining and Labor Conditions in the Region

Cost.—The men who are making chazel holes under contract are paid according to the regulation size of holes. For a hole 10 feet long, 6 feet high and 5 feet wide, the payment is 2,500 coppers, or about $20. All the material and tools required in this work is furnished by the company. There were about 80 men under contract at the time of the writer's visit.

The men who carry the ores in baskets from different parts of the mines are paid from 15 to 25 coppers per 100 catties of ore according to the distance they have to travel between their starting place and the sampling house.

The men working on small grinders, get 20 coppers each per day and those working on the cradles get 35 coppers each.

The men working with his mule on the large grinder, gets 34 coppers for every 100 catties of powdered ore produced including the work of breaking the ore into small pieces before it is transfered to the grinder. The men were formerly paid 43 coppers per 100 catties, but owing to the declining condition of the mines, a reduction in their wages has been made. They have however, been assured that their original wages will be restored as soon as the Company can increase its output.

Labor Condition.—The nominal wages as stated above, seems to have satisfied the poor community. The total number of men employed by the Company (the Tsaoyuen Gold Mines Company) was only 120 at the time of the writer's visit with the exception of those who worked for the Company under contracts. Out of 120 men, 35 were working in mines; 12 were rock carriers; 15 were in sampling house; 3 were foremen; 46 were engaged in the milling plant; 3 were blacksmith; 6 coolies. The aggregate monthly pay roll of the Company amounts to $250. It is said there were not less than 3,000 men who had worked for the Company some 18 years ago when the Company was in the most prosperous condition.

In spite of the nominal wages the men seem to be quite satisfied. as no strike of any nature has ever been originated in the history of that Company.

Financial Conditions.—Without exception the mining property is usually leased and seldom sold to the Tsaoyuen Gold Mines Co. The owner of a mining property may do some developing work at the beginning before the property is leased to that Company, but such a case is rather rare. Most of the owners do not take any trouble to secure their mining rights nor do they develope their property to any extent. If a property is required by that Company, the owner of that property will be asked to sign a lease, for which rent is given which varies with each property. A great portion of the Company's property was leased in that way and the leasing system has perpetuated itself and is still in extensive practice. In many cases leases run from five to ten years, and in others are renewed every year. No royalties are paid to the owner of property whatever success may attend the efforts of the Company.

It is said that the Tsaoyuen Gold Mines Company has had no great success for the last 15 years. It was particularly true that the production of gold in the early part of 1917 was hardly enough to cover their expenses.

Structural Features of the Gold Deposits

Principal Types.—The prevailing types of this auriferous sulphide ore may be referred to (1) banded and (2) irregular ore bodies. These two types are not sharply distinct and they may occur together. As here developed, the first type consists of varying width of banded ore bodies (Figs. 2 and 6) approximately parallel to each other, ranging individually from a few millimetres to several centimetres in width, rarely exceeding 39-40 centimetres, whereas the second type consists of irregular patches as shown in Figs. 3, 4 and 5. Within these unusually wide belts of fracture, can be distinguished two or more zones of concentrated fissuring, which lie close enough to be regarded as compound fractured zones (Fig. 4).

In addition to these two types, the auriferous sulphide ore bodies may be found scattered individually in quartz, or form aggregated patches, more or less parallel to each other. Further, a narrow fissure may be accompanied by curved and irregular fracturing and in these instances usually occur the ores of great value and may be regarded as stringers (Fig. 6). This type which is commonly found in the productive part or on the upper levels, is believed to represent some of the ore shoots. In all these cases, the evidence of the ore deposition in open fissures is strongly indicated. In others the ore stringers became small and barren toward the side of the vein, and the rich ores may be concentrated only in the mid-part of the vein forming an exceedingly fine net work of veinlets as shown in Fig. 6.

The structures thus far described are those associated with the mode of occurrence of the gold ore in quartz veins. As to the shape of the quartz veins themselves, they are more or less lenticular (Fig. 1) and not uncommonly follow the strike and dip of the inclosing rocks, chiefly gneissic granite.

It is very striking that many of the fissures occupied by those quartz veins are in some cases immediately close to the dolerite dykes, whose structural details connected with such associations are here briefly recorded. As seen in the underground workings, these basic dykes have a general tendency to split, as a result of underground weathering, into thin slabs roughly parallel to the dyke walls. Fissuring along the line of such a dyke forms a well-defined sheeted zone which generally constitutes a belt of productive lodes. A considerable number of the productive lodes on various levels in the Linglingshan mines, lie alongside these weathered dykes, and this fact has been used by the miners in that region, as a criterion for the discovery of rich veins. But the fact that the dolerite dyke itself is, so far, not known to carry any gold and that the dyke traverses some quartz veins at several places, no genetic relation between the auriferous sulphide deposit and the dolerite dykes, is indicated.

Distribution of the Lode Fissures.—As a structural element, the auriferous sulphide quartz lode fissures of the Linglungshan region

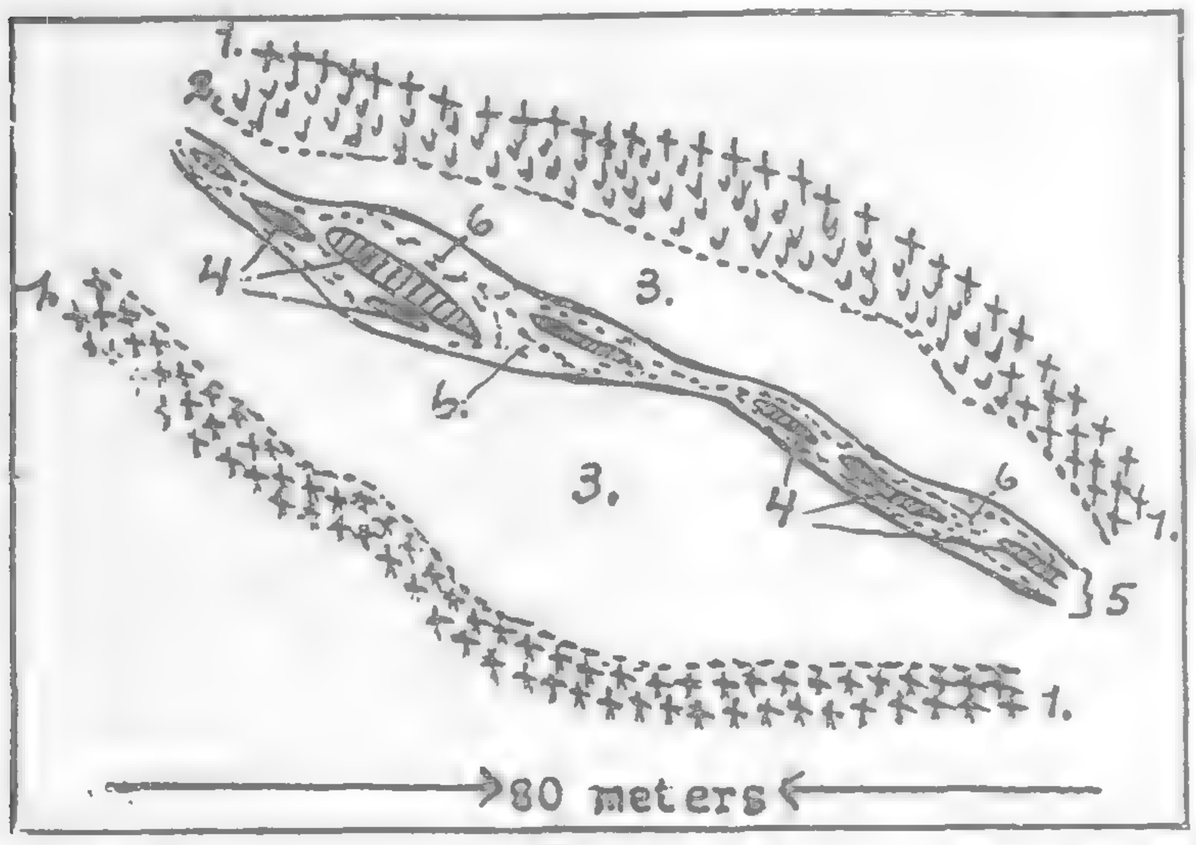


Fig. 7

1. Gneissic granite.
2. Dolerite dyke.
3. Portion of the quartz vein without any ore.
4. Irregular auriferous sulphides in the fractured zone in the quartz vein.
5. Fractured zone.
6. The primary and secondary quartz in the fractured zone.

Section showing the character of the replacement ores which are cemented by coarse and fine-grained quartz in one of the richest quartz veins in Linglungshan. Looking N.E.

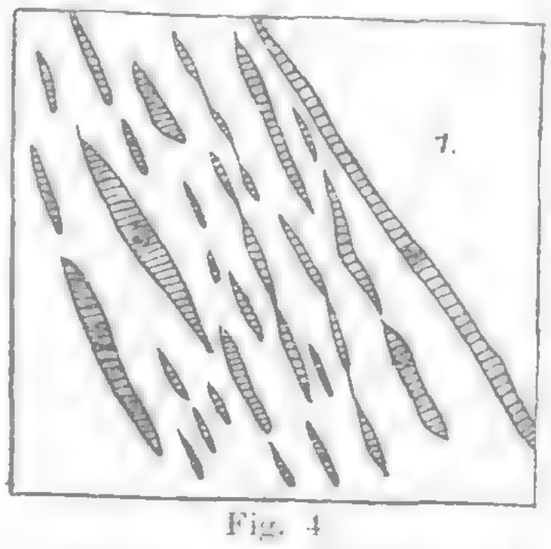


Fig. 4

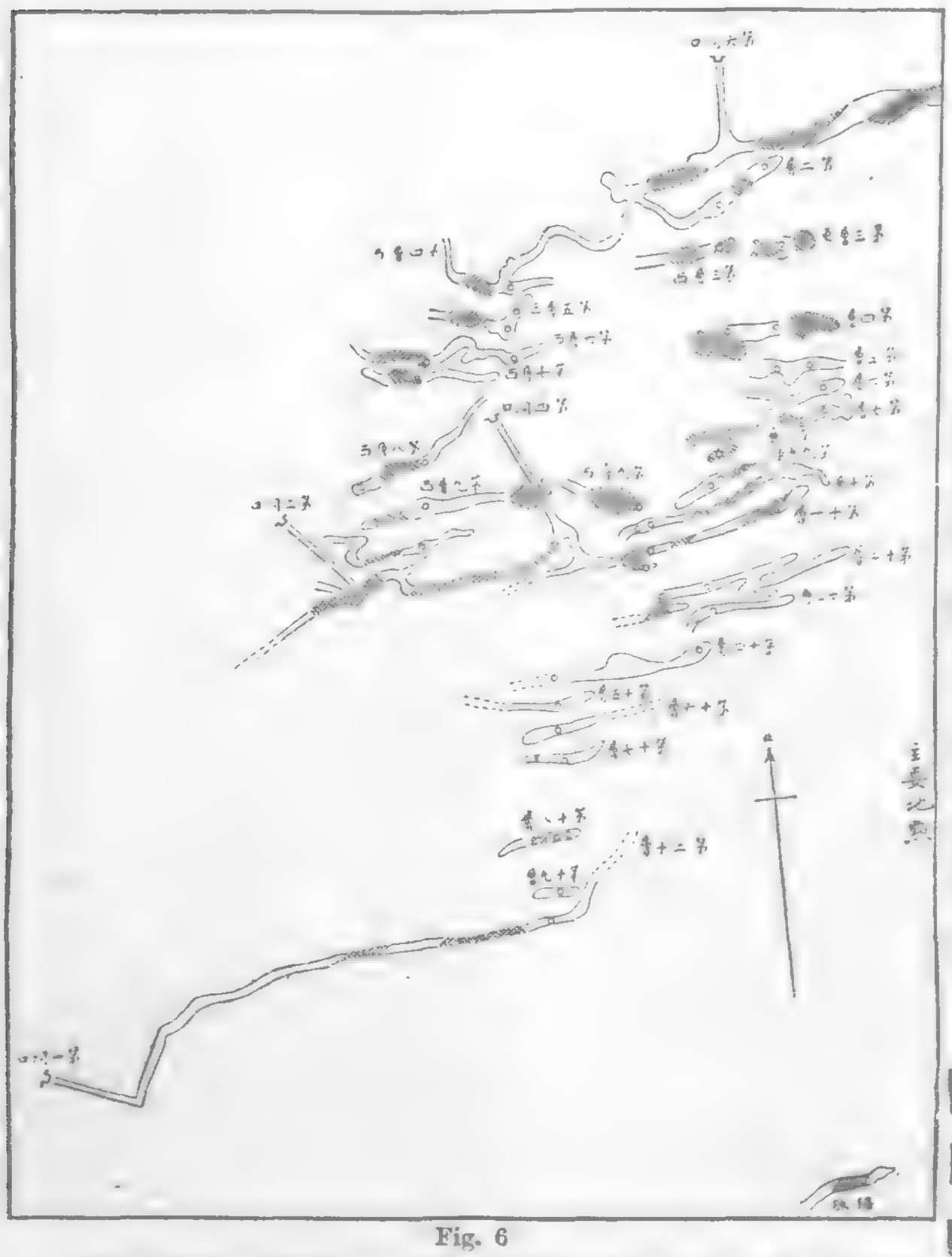
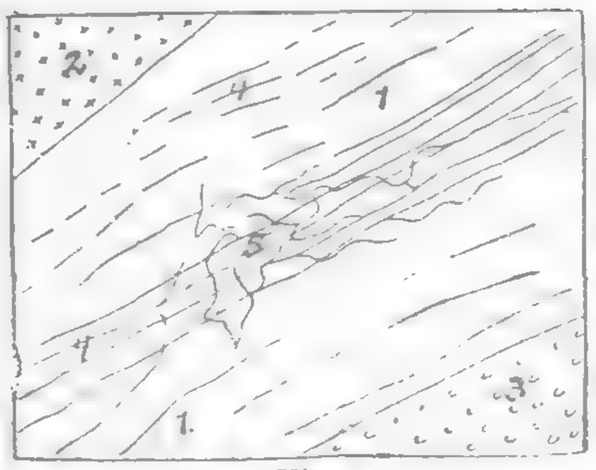


Fig. 6

Plan showing position of various levels and some of the principal locations, where a large ore body has been mined out in the Linglungshan Mine, Linglungshan, Tsaoyuen Hsien, Shantung.



1. Quartz vein.
2. Coarse or gneissic granite.
3. Dolerite dyke.
4. Bands of auriferous sulphides in the quartz vein.
5. Stringers of auriferous sulphides in the same vein.

Fig. 5

Sketch of a compound fractured zone showing the bands and stringers of auriferous sulphides in a quartz vein. Level 7.

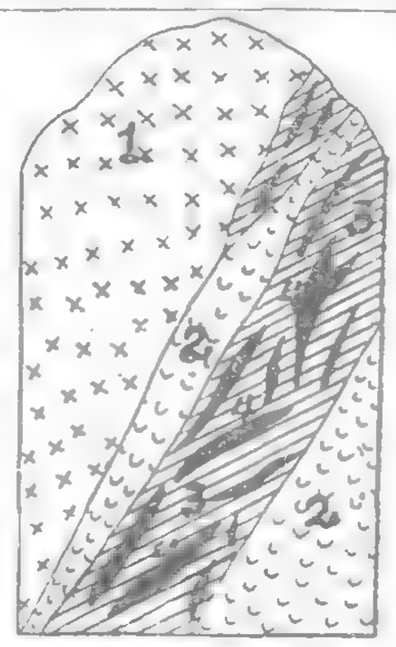


Fig. 3

1. Coarse or genissic granite.
2. Dolerite dykes.
3. Quartz veins.
4. Patches of auriferous sulphides.

Vertical section showing irregular patches of ore bodies in a quartz vein with intersection of the vein by a dolerite dyke. Level 1.

1. Quartz vein.
2. Irregular bodies of auriferous sulphides.

A section drawn from a specimen showing the actual shape and distribution of the irregular auriferous sulphides in a quartz vein.

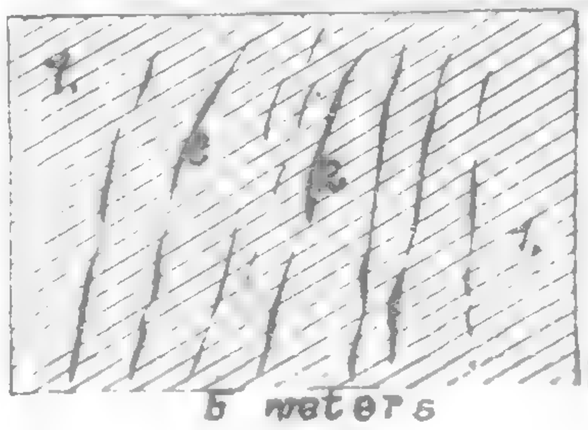
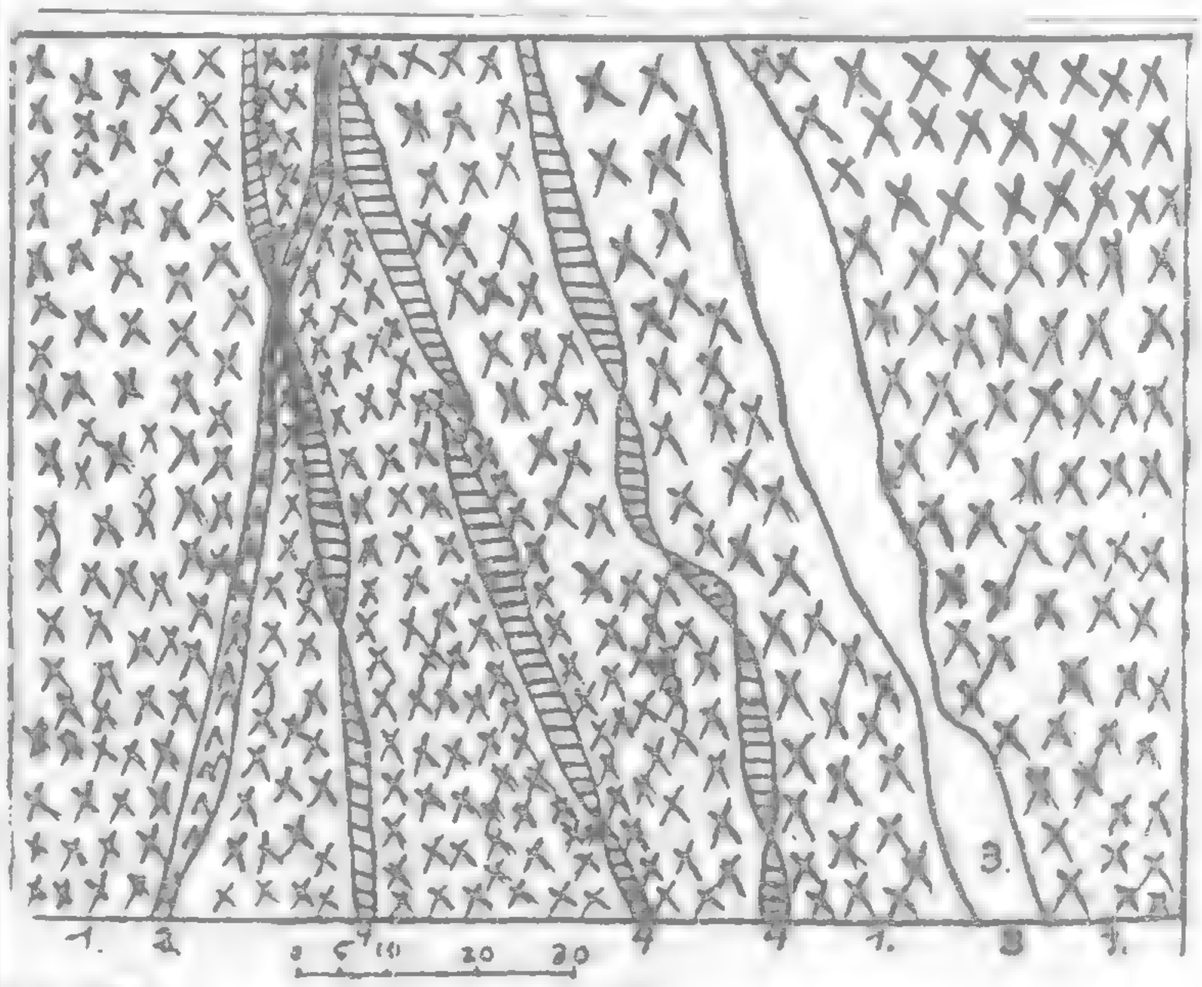


Fig. 2

1. Quartz vein.
2. Auriferous sulphide bands.

A section in which varying size of auriferous sulphide bands distributed almost in the whole width of a quartz vein. Level 11.



1. Coarse or gneissic granite.
2. Dolerite dykes.
3. Quartz vein without auriferous sulphides.
4. Quartz veins with auriferous sulphides.

Fig. 1

Vertical section of Hungtsinpeh Quartz veins, their distribution and lenticular structure with intersection of one of the ore carrying veins by a dolerite dyke.

are exceedingly conspicuous. They are in some cases marked by bold outcrops of quartz which usually show the character of recrystallization and which are often superficially coated by ferruginous gossan. It is equally perceptible that the structures of these fissures, at least the principal ones, have been traversed through by faults, the most notable ones are Hsanshan fault and Lushan fault. They are, however, difficult to recognize as the mass of their rocks along these fault lines, is identically the same everywhere, so they are for the most part indicated only by broken lines on the geological map.

Both folding and faulting especially the latter, have undoubtedly influenced the present topographic development of the region, It is this relation what facilitated the discovery of the ore deposits and which renders it possible to follow the veins along the upper part of the hills without stripping off the overlying rocks, and sinking test pits in the early stages of the mining development in this region. Consequently most of the claims of the Tsaoyuen Gold Mines Company were laid out along the aforesaid fault lines which have proved to be the lines of productive lodes. Furthermore, the principal lodes, such as those of the Linglungshan and Lushan systems are quite apparent on the surface.

On the geological map, the outcrops of the principal lodes are represented with their relative positions and courses. The parts, which are obscure or are abruptly disconnected, are represented by dotted lines. As far as our observation goes, the group of the productive lodes is found invariably in the gneissic granite and is strongly developed within the area occupied by Linglungshan and Lushan ranges, which are approximately 12 *li* in length and 1½ *li* width.

Beyond this general productive tract a few productive fissures are also known to occur in some superficially isolated gneissic granite hills, only a short distance south of Linglungshan. The west part of Lushan range, extending for a distance of about 3 kilometres to, and include Mashan mountain, is a part of the region under consideration, and has been prospected by the Tsaoyuen Gold Mines Company at different times. It also exhibits outcrops of lode fissures, though the line of outcrops is not clear and it is not shown on the accompanying geological map.* The area which lies immediate southeast of the present main camp does not appear to be productive as far as the gold deposit is concerned. But about two or more kilometres, south-east of Linglungshan range. A vein known as Koshenkeh-Pudehkong vein, appears to be economically important. While the vein is moderately developed, the productive part has not, as yet, been reached. It appears, however, to be less fissured than the portion stretching from Linglungshan to Dayingting and reappearing to the east and northeast of Tutsingkeu.

It is certain that the region probably contains many more important fissures than are shown on the map, but this probably shows the essential arrangement of the lode distribution. As to the question whether the productive fissures are truly local and extend in depth with undiminished intensity, nothing can be said with certainty at the present time. Such conclusions cannot be drawn until some further development work has been done for a depth, say of 300-500 feet below the present lowest level.

The strike of the principal lode fissures, as they appear on the surface, is generally southwesterly in Linglungshan mountain while in the southern half, on the east side, of Lushan mountain, a west-southwest strike appears to predominate. It should also be understood that the above applies to the fissuring which has been observed in the course of topographic surveying.

Origin of the Fissures

It has been shown that the principal fissures in which the auriferous sulphide quartz veins occur, are largely confined to the coarse grano-gneiss or gneissic granite, and that their formation was undoubtedly accompanied by slight faulting in character. The fissures which are occupied by the dolerite dykes are very similar to those occupied by auriferous sulphide ore-bearing quartz veins and more or less related in direction and distribution. Under these conditions, they might well be taken to have been associated with the gold deposit in quartz veins in point of geological time. But from the fact that no gold has so far been found in these basic dykes, it is believed that the ore-bearing solutions worked into the cracks and small fissures developed on cooling in same of the quartz veins, probably long before the intrusion of the dolerite dykes. This is clearly shown in the underground workings where a basic dyke traverses some quartz veins (Figs. 1 and 2) particularly in a sheeted zone. The sequence of the events seems to have been as follows :

1. Fracturing and sheeting in gneiss probably during the period of its metamorphism.
2. Intrusion of grano-gneiss or gneissic granite.
3. Intrusion of pegmatitic veinlets, and of quartz veinlets into the geniss toward the end of intrusion (2).
4. Fracturing on cooling in the gneissic-granite.
5. Intrusion of quartz, largely as quartz dykes into the gneissic-granite and gneiss, and slight fissuring in part of these quartz dykes probably by mere contraction on cooling, whereby cracks and small fissures were developed particularly at the contact with the already cooled gneissic-granites.
6. Ore deposition by emmanations and ascending solutions, as a result of the dying out the volcanic activity.
7. Intrusion of basic dykes filling the rest of the fissures in the gneissic-granite and gneiss.

The areal distribution of the fissures and their relative position to the dolerite dykes point to the fact that they were produced by local and not by regional stress. In seems most reasonable to regard the Linglunshan fissures as having resulted from certain local stresses.

Since the rocks were in most cases fractured and not noticeably displaced there is no clue to the direction and character of the forces which produced the faulting. Under these conditions the possible explanation for the characteristic sheeted structure of the auriferous sulphide quartz veins in this district necessarily involve compressive stresses. In the process of the solidification of the coarse granite intrusions, a slight sinking in part by forcing a rigid mass to adjust itself to a slightly smaller space of different shape, would produce compressive stresses in the subsiding mass. These stresses would be relieved by fractures on cooling. Similarly the quartz dykes would produce the same effect on solidification by their own compressive forces. Faulting had undoubtedly assisted the formation of fissures in the granite system, but the amount of settling due to cooling necessary to produce fissuring of the kind in the quartz system would be enough and needed no faulting to assist. It is believed, however, some leter process by solution such as the process of replacement had also taken part in the formation of these fissures in the quartz system prior to and during the same period of the ore deposition in it.

This explanation supplies also a clue to the observed relation between the dolerite dykes and the auriferous sulphide quartz fissures. The former may be regarded as a final but a separate magmatic eruption of the volcanic reservoir, squeezed, after the formation and mineralization of the latter, into the fissures formed largely by settling of the solidified grano-gneiss or gneissic granite intrusions. Thus the intrusion of the dolerite dykes cannot be regarded as genetically related to or directly connected with the gold deposition or the intrusion of the quartz dykes which will be called quartz veins in the discussion of ore deposits in this paper. The dolerite intrusions were the final structural manifestations of volcanism in the region and succeeded, not directly, the gaseous and aqueous emmanations and ore deposition in quartz.

Summary of the Ore Deposits

General Character and Occurrence.—The characteristic feature of the Linglungshan ores is the occurrence of the gold mechanically mixed with sulphides in quartz veins. The sulphides are chiefly iron pyrite and, to a minor extent, chalcopyrite. The copper pyrite, with which is generally associated an unusual quantity of free gold, occurs mostly in ore shoots. Galena and sphalerite are only sparingly present in the majority of the quartz veins, and as a rule they contain very little or no gold to form ore. Silver is usually present in the ore and its proportion to the amount of gold is shown in the following table :—

* See previous issue.

Location.	Condition of the sample analysed.	Au in oz. per ton.	Ag in oz. per ton.
Laoniutung	Oxidized	3.4406	.2150
Linglungshan	,, ...	5.268	nil
,,	,, ...	3.763	,,
,,	,, ...	3.010	,,
,,	,, ...	7.848	,,
,,	Fresh, richly auriferous ..	17.203	.322
,,	,, ...	4.838	2.472
,,	,, ...	10.752	.430
Hungzaya pit	,, very poor ore ..	trace	trace
No. 6th adit.	,, poorly auriferous ..	,0269	,,
Linglungshan	,, taken from the edge of a rich vein ..	trace	,,
No. 20th adit.	.. .. ..	,,	,,
No. 10th level	,, ...	2.7955	1.9384
No. 5th ,,	,, wholly pyrite ..	trace	trace
No. 14th ,,	,, ,, ,, ..	nil	nil
No. 14th ,,	,, ,, ,, ..	trace	trace

The quartz, whether or not it carries auriferous sulphides, is believed to have partly accompanied and partly succeeded the intrusion of pegmatitic and quartz veinlets in the gneiss system after the main eruption of the grano-gneiss or gneissic-granite. The strikes of these quartz veins seem to have followed the fissures which mostly run northeasterly and to a less extent those which run east-northeasterly. Only in a few cases does the strike of certain veins appear to have run across that of the country rock almost at a right angle, that is northwesterly, but these veins merely represent branches of their respective mother veins. The angle of the dip of the quartz veins varies from 45 to almost 80 degrees to west and northwest as the case may be.

In some cases the ore forms lenses or patches that differ considerably in horizontal extent and thickness and these patches may be distributed throughout the veins of quartz which is almost the only gangue mineral.

Large grains and threads of gold arranged in radial manner were once found in a quartz nodule enclosed in a mass of quartz, but in the cases investigated the gold was found to exisit in that portion of the vein particularly rich in *massive* iron pyrite or chalcopyrite or both. As a rule the iron pyrites are in broken masses and in part cemented by chalcopyrite. They often completely surrounded the quartz of coarse grains, though the masses of the ore occur along the crevices and joint planes in small crescents in the quartz. Wherever the ore occurs, the quartz is fractured and much of it appears granular between the cross nicols and is commonly enclosed in sulphides. The veins of value rarely exceed 40 feet in width and in most cases are only several inches to 7 or 8 feet wide, and from a few feet to 100 or more feet long. Within this whole length, the width of the vein is by no means uniform but is habitually characterized by swells and pitches. (See Fig. 1). Whether or not the veins are continuous in depth is not, as yet, ascertained.

While these auriferous sulphides largely occur as fillings in numerous cracks in the quartz veins, they are, especially pyrites, sometimes found in small crystals among the quartz grains. As previously stated, some of the rich gold deposits occur as ore shoots. These ore shoots consist of quartz, pyrite and chalcopyrite, the latter is the most abundant admixture of the ore in these ore shoots. The deposits of this character seems to have been confined to the uppermost horizon of the mine, as they are seen only on the high levels. They have been and still are worked for their gold contents, the copper being entirely neglected as in the case of the pyrites. As a rule, the gold content in these deposits is usually high. An average percentage reaches 11.934 ounces gold per ton, and the amount of gold from a group of specimens taken from one of those ore shoots, showed 17.203 ounces gold per ton. Much to our regret the data on the copper content in these gold deposits is not available because of unwillingness of the industrial chemical bureau to make the complete analysis for us.

There are also variations from what may be considered typical quartz veins. The fissures or cracks which were filled by a granular mass or crystals of pyrite, are of no importance, as appreciable amounts of gold are usually found only in massive pyrite. This is clearly shown by the productive veins above and below the 8th level.

Aside from the occurrence in sulphides, the gold is usually present and rich in that portion of the quartz vein which has been more or less oxidized under the influence of weathering. In this connection, some of the richest ores have been mined wholly from the weathered or oxidized quartz veins and this will be discussed more fully when we come to consider the vein oxidation.

As to the extent of this gold deposit, it may be safe to say that the sheeted zones in which the auriferous sulphide quartz may lie extent, on the east side of the present main quarters of the Company, from the hill just south of the village of Tatsiachia, to the northeast of Hsanshan; on the west side from Hunzaya to Laochukeh, and from Ditaokien to Mashan mountain; and on the southeast, from Pugehkong to Kohshankeh. The outcrops of these lodes are best shown on the east side of the main quarters of the Company while those in other parts are not all connected or wholly recognizable on the surface.

Vein Oxidation

The Extent.—As generally understood, the depth of oxidation coincides with the depth of the ground water level of the region, but there are exceptions to this general rule. The oxidized veins are largely confined to a very narrow zone below the surface, as fresh quartz veins carrying auriferous sulphides, occur high above the water level. Where the oxidation has gone far enough in a quartz vein, the changes are usually so thorough that the pyrite is completely changed into iron oxides and the copper sulphide, if any, is either reduced to native copper or oxidized to a sulphate. In these cases, the original structure of the quartz vein is usually destroyed and shows a peculiar cellular structure, the cavities and vugs being lined with minute crystals of quartz and their walls being generally coated with iron oxide as observed in severed pits at Huntsinpeh and Laoniutung. From a close examination the gold may be seen to be practically confined to these cavities, or vugs, or to that portion of the quartz veins, in which the oxidation is most thorough. In other cases, the oxidized auriferous quartz vein appears as homogeneous brown soft mass; in still other cases the very rich oxidized ore-bearing veins are composed of a white compact material, very much like alunite, or a soft mud more or less mixed with jasperoid or a material like a thick brown mud of limonite, kaoline and quartz sand.

The Process and Influence of Oxidation.—In the process of oxidation, the meteoric waters are the most important, if not the only, agent. The pyrite in fissures, cracks and joints, which from the most common mode of occurrence, is most easily attacked by such waters, and from its oxidation, yields ferrous sulphate and sulphuric acid,

$$2FeS_2+7O_2+2H_2O\text{———}2FeSO_4+2H_2SO_4$$

the latter is easily oxidized to a basic ferric sulphate,

$$4FeSO_4+{}_2O+2H_2O\text{———}4Fe\,(OH)\,SO_4$$

While these waters reduce considerably the volume of the ore and remove many of the constituents, mainly of pyrite, the gold content in the veins becomes prominent and is concentrated as the oxidation proceeds. It was due chiefly to this influence of oxidation that a very decided enrichment was found in the oxidized part of the deposit. As far as the Linglungshan region goes, this zone of oxidation (sometimes called zone of weathering) is extremely shallow in many parts of the region.

In some cases a solution and redeposition of gold must have taken place. A part of the gold in the oxidized veins is likely dissolved by the percolated waters carrying ferric sulphate commonly formed in such waters as shown in the equation (2). As soon as the oxygen in the percolated waters is used up the undecomposed sulphides of the cementation zone will act reducingly upon the decending solution to re-percipitate the free gold. So a part of the gold of this zone is really of secondary enrichment and accounts the fact that it either coats the primary sulphides or, as is more frequently the case, fills the cracks within them as an additional portion of gold to the already existing auriferous sulphides in fissures within the quartz veins.

It is an interesting fact that the ores which have been shipped from these mines came either from thoroughly oxidized veins or those of the cementation zone, which is immediately below the zone of oxidation. The analyses obtained of the samples taken from various parts of these mines, tend in the same direction. The ores from the cementation zone yielded, on average, 4.452 ounces gold per ton while the ores from the oxidation zone yielded 4.6655 ounces of gold per ton.

It is also common to find that a very decided leaching of silver has taken place in the most oxidized gold quartz veins. Much more silver occurs in the unoxidized parts of the rich veins than in the oxidized portions, for the unoxidized ores as much as 2.472 ounces silver per ton was obtained, while only .215 ounce (only two-fifth of an ounce) silver per ton, or merely a trace, or, as is frequently the case, none at all is found, in the oxidized ores. This difference may be taken as an indication of the removal of silver during the oxidation of the auriferous sulphide quartz veins or lodes, though the difference may possibly, but not probably, be due to original unequal distribution of silver in the veins.

As to the question whether the gold content in the metal sulphides in the quartz veins in this region decreases, or increases, or remains constant in all depths, it is not easy to form an opinion. The writer inclines to the belief that the oxidized ores as well as the ores occuring in the cementation zone, must be richer than the corresponding auriferous sulphide quartz veins, in greater depth. Not till some further development work is done, as recommended elsewhere in this paper, can the exact nature and extent of the ore body be ascertained with certainty.

Genesis of the Ore-Deposits

Origin.—Concerning the origin of this gold deposit, two ways of derivation may be suggested. Firstly, the ore may have been leached from the neighboring rocks, the gneiss, gneissic-granite and dolerite dykes by descending and ascending surface waters, and secondly, the ore may have been segregated from cooling intrusive magmas and brought up as emmanations by ascending surface waters. That it was leached from the surrounding rocks by surface waters is exceedingly doubtful, for this hypothesis does not furnish an explanation of the confinement of the ores to the quartz veins in this region. Furthermore, the determination of gold in any rocks, other than those quartz veins, from this region, would have little value, for the fact that a general permeation by solutions has undoubtedly taken place since the deposition of the ores and that an invisible seam in such rocks might carry enough gold to vitiate the conclusion. From the consideration of the mineralogical character of the quartz veins, which are solely composed of quartz, sulphides (iron pyrite and chalcopyrite) and free gold which is mechanically combined with the metallic sulphides, the writer is forced to fall back upon the second alternative, namely, that the auriferous solutions were emmanations from a dying intrusive magma and were brought within the reach of percolating waters by their own force under the influence of diminishing pressure and the driving force of heat. The emmanations were finally dissolved in these waters and by them carried into vein fissures.

As to the exact chemical conditions existing in the ore bearing emmanations, we are still in the dark, but since the gold is in with the metallic sulphides and the whole metallic mixture often occur with some decidedly secondary quartz in the primary quartz veins, it is here assumed that the auriferous solutions were ionized and balanced as auro-silicanion and as thio-suranion* as in case of most electrolytes. Upon deposition they were freed simultaneously as free gold, metallic sulphides and secondary quartz, due to various physical and chemical conditions. Further, the precipitation of gold in presence of ferrous compounds and sulphides of iron and copper have long been known to chemists and geologists. The abundance of iron and copper sulphides together with the occurrence of gold within them as found in all pay veins, seems to throw further light on the conditions, under which the gold ore in the Linglungshan region as well as in other parts of the province of Shangtung that have been examined by the writer, was deposited as stipulated above.

In the absence of complete data, however, i.e., analyses of all the rocks associated with the ore-bearing quartz veins, the above explanation of the origin and the manner in which this gold ore was deposited must necessarily be tentative.

Time of Deposition

The ores were formed later than the formation of the enclosing quartz veins and earlier than the intrusion of dolerits dykes. Before the deposition of the ore bodies, the quartz veins in this region had probably suffered from a "Solution of Continuity," thus giving rise to numerous crevices in many parts of the veins. The crevices or cracks developed in that way were cemented by the ores as well as by aggregates of quartz which were probably, if not surely, deposited from the original ore-bearing colloidal solutions as mentioned above, and which is not improbable to have been supplied in part by the colloidal silice in the waters percolating through the zone of weathering since desilication is one of the chemical reactions in that zone. The ore-bearing sulphides are seen not only to have traversed between the grains of original and secondary quartz, but also to have surrounded or been deposited upon the grains of quartz. These characteristic features are clearly shown in thin sections and in some hand specimens.

Concerning the absence of gold in the dolerite dykes and gneissic granites which often show a close proximity of positions to the auriferous sulphides quartz veins, it is believed that gold was not derived from these igneous rocks. This statement is based on the fact that the latter constitutes an early part of the volcanic intrusion of the region and that the former cuts across some quartz veins at one or more places in the mines.

The only possible doubt as to the derivation of gold from dolerite dykes, is suggested by the fact that wherever a dolerite dyke is found to have thoroughly weathered and broken into slabs, or more or less as a darkish thick mud, which the miner calls "Hehmien," black face, the approaching of an ore-bearing quartz vein may be expected as far as the experience of those miners is concerned. But the weathered dolerite itself carries no gold whatever according to the experience of the same people, and, therefore, throw no light on the consideration of gold from those dykes. It is recorded here for future consideration.

Conclusions

Future of the Gold Mines in the Linglungshan Region.—To predict the future of any mine is no easy task; the conditions under which most ores deposited are as yet too imperfectly known and the deposits themselves are usually too erratic in form and distribution to give certitude to such predictions, even when these are based upon a careful study of the history and present condition of a mine. Nevertheless, it is part of the duty of the geologist who has officially investigated the gold deposits of the Linglungshan Region to interpret to the best of his ability the bearing of ascertained facts upon the future of mining. For such a forecast of the future moderate probability is all that can be claimed.

As has been pointed out in the preceeding pages, the richest known ore bodies that the Tsaoyuen Gold Mines Company has so far mined, are apparently confined within a zone which extends from the surface to their 11th level, a depth of 300 feet or less. In general, explorations below that level have been very much less satisfactory as regards quantity as well as quality of the ore than explorations above. There is no possitive indication, however, as to the depletion of the ore-bodies below the present lowest level, the level 20. On the other hand, the number of ore-bearing veins that are rich in gold, have all been found in the high horizon.

It is probably true that the ore bodies, known or unknown, occuring below the 300-foot zone, are neither so rich nor so abundant as those occuring within that zone. The discovery and exploitation of those ore bodies in greater depth will undoubtedly encounter increasing difficulties, chief among which is the problem of dealing with the underground water. For these reasons it is unlikely that the zone between the present lowest level and a depth of 500 feet beneath, will yield as much gold as the zone between the surface and the level 11, but it is probable that some strong fissures may carry paying ore to far greater depths than those already attained.

As regards the zone between the surface and the level 11, it is well to bear in mind that it still contains much ore, both as parts of known ore bodies and as yet undiscovered ore bodies. It is certain that many of those undiscovered ore bodies will be developed and mined in the near future and that this zone will constitute the most important part of the entire production.

It is probable that the production of the gold in these mines, while exhibiting fluctuations, will, on the whole, slowly decline. New ore bodies or rich ore-bearing lodes will undoubtedly be found from time to time, and such individual lodes may prove to be very profitable in the future as in the past, or even more so. An increased output of gold may be expected to follow each successful step in deep drainage. But existing conditions seem to indicate that if the maximum production of 50-60 ounces gold per day in the 23rd and 24th years of Kwang Hsü, is to be revived, this will be due to the nature of the ore bodies encountered in the upper zone.

*Gold by Maclaren, page 103.

Repairing the Yellow River Break

Kung Chia Ko, Shantung

Asia Development Company completes a notable work

TWO years ago, to August 1921, to be exact the Yellow River broke through the northerly dike at Kung Chia Ba near Li Ching, Shantung, and spread northward over portions of seven counties. Approximately 500 towns and villages were destroyed and a quarter of a million people were made homeless. In November 1922, Civil Governor, Hsiung Ping chih of Shantung signed a contract with an American firm, the Asia Development Co., Ltd., and thus for the first time in history foreign engineering and technical skill were employed in connection with Yellow River conservancy work. The service in this case was utilized only for the repair of the Kung Chia Ko break but it may point the way to the application of modern engineering principles to the whole Yellow River problem.

The river broke through the dike on the convex side of a sharp bend. At the time, the discharge of the river was near the maximum recorded, that is about 300,000 cubic second feet. The water did not overtop the dike but started to seep through, washing out a gap before it could be stopped. The breach quickly widened to about a mile in width and as the level outside the dike was about 6 feet lower than the river bed inside, the bottom of the channel was lowered for some distance above the break. The old channel below the break silted as the flow through it practically ceased. After several months of survey and study of the problem, the Asia Development Co. engineers adopted the method for repairing the break shown on the plan published herewith. The essentials of the plan actually executed are as follows: The short bend of the river was eliminated by cutting a new channel (L) across the same, 6,000 feet in length, 12 to 16 feet in depth, 500-ft. wide on the bottom and 900 feet wide on top. In order to secure a proper hydraulic gradient a scouring channel (S) was excavated below extending from the lower end of the new or leading channel above seven miles down stream. This scouring channel was made 200 feet wide on the bottom and varied from four to seventeen feet in depth. The excavation of these channels necessitated the removal of approximately 3,000,000 yards of earth. The maximum number of laborers employed at one time on the channel and dike work was 23,500. The excavated material from the leading channel was utilized to build a new dike (" A ") on the northerly side more than 200 feet in width. The standard Yellow River dike is 40 feet wide on top.

In order to divert the river into the new channel a dam was constructed across the stream at a point 800 feet in width during low water. This was accomplished by firstly driving a timber trestle or temporary bridge upon which were laid light railway tracks. (Oregon pine piles 50 to 75 feet long were used.) The rock which formed the core of the dam was transported by means of push cars from the storage piles on to the trestle. Altogether approximately 40,000 yards of rock were dumped into the river. This was followed by placing bags of earth, kaoliang stalks, pack-work and an earth fill until the dam was sealed and formed a part of the northerly main dike.

From the dam a new dike (D) was built westerly to a connection with the old northerly dike. Just westerly of the dam a long groin was built to deflect the water into the new channel.

After diverting the river dike (E) was constructed joining the broken ends of the old northerly dike. This forms a second line of defense against the river. Dike (A) was extended north-easterly (C) making it possible to widen the narrow bit of the river just below the leading channel.

From the Chinese standpoint, there was little new in this method except the dam but that was the essential feature which enabled the contracting company to guarantee the success of the undertaking. In other words it was a positive and sure way of diverting the river, while the old Chinese methods are uncertain and cannot be guaranteed. Such of the full breaks as the Chinese have succeeded in closing have been done as follows: First the broken ends of the dike were extended until the stream was confined in a narrow channel. Then big mattresses or rolls of bamboo and kaoliang stocks were floated into the breach and held by means of ropes. In this way the channel, when the attempt was successful, was sufficiently choked to permit complete closing with kaoliang pack-work and earth fill. One of the occasions when this method succeeded was in connection with the famous break of 1887, near Kai feng where the river broke through the southern dike and flooded the Wei River valley. The attempt made the first winter failed but the second year, conditions being more favorable the breach was finally closed.

The reported cost was Tls. 6,000,000, while the contract price for the Kung Chia Ko work is $1,500,000 Mex. The Li Ching break is located about 100 miles down river from Tsinanfu or the Tsin-pu Railway, Yellow River Bridge. The transportation of rock, machinery, materials and supplies as well as communication services for the staff presented problems of some magnitude.

The rock for the dam had to be transported from near Tsinan and in all about 400 junks were used in this service. During the time that over 20,000 laborers were employed, approximately 200 tons of grain had to be shipped down river each week. In addition, timbers, pile driver, engineers, pumps, tracks, cars and miscellaneous supplies of all kinds were shipped by boat.

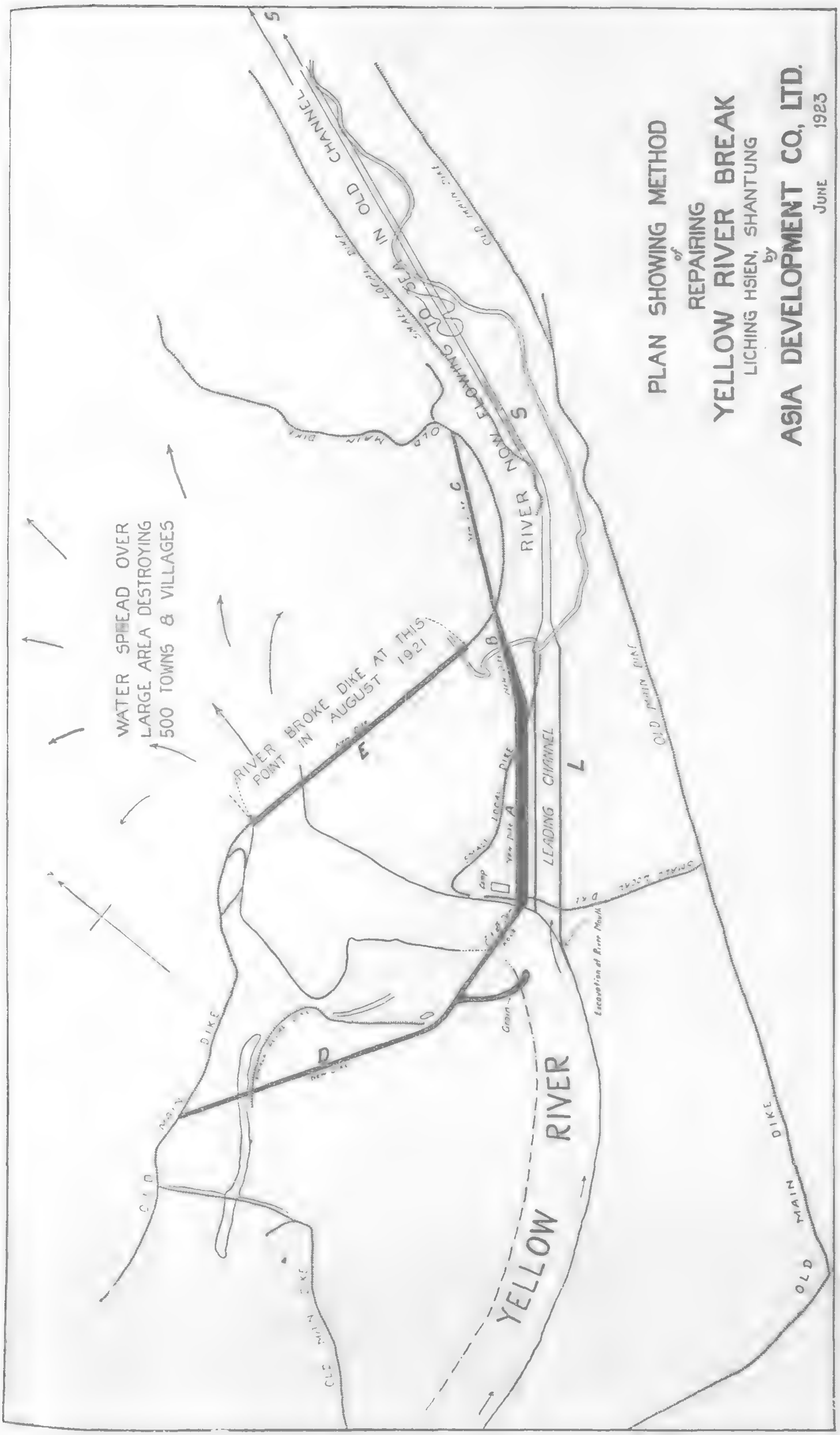
In 1922 The Asia Development Co. constructed for the Shantung international relief committee a road from the Tsingtao Railway at Chowtsun forty miles northward to the south dike of the Yellow River. At the time of starting work at Kung Chia Ko in



In August 1921, the Yellow River broke through the north dike at Kung Chia Banear Li Ching, Shantung—Winter scene, flooded area



Excavating New Channel 6,000-ft. long, 14-ft. deep, 500-ft. wide on bottom and 900-ft. on top



December 1922 the company re-surfaced the top of the dike from this road to the construction camp, a distance of about 37 miles. It was also necessary to re-surface the road which had become badly rutted by carts; in fact it was necessary to continuously employ road maintenance gangs. Although a dirt road, it was thus possible to keep it in fair condition and with the Dodge car the trip of 77 miles from the railway at Chowtsun to the camp was frequently made in three hours and sometimes less. On the road transport service a Dodge, a Ford car and a Ford combination bus and truck were used. The company had agreed to guarantee its work at Kung Chia Ko during the 1923 flood season. Inasmuch as the motor road will become impossible during the rainy season a high-powered speed boat will be put in service on the Yellow River for communication purposes between Tsinanfu and Kung Chia Ko.

The "human" engineering was perhaps the most difficult. The recruiting, feeding and handling of up to 23,500 coolies presented numerous problems. In this connection two innovations of interest proved successful. In order to speed up the earth work a bonus and prize system was put into effect. The workmen responded to this better than was anticipated. A cash prize, first, second and third was offered for the gang (30 men) which moved the most dirt in a week. The winning gangs were given appropriate flags which they had the right to fly over their section until it was lost to another gang. A gang won a first prize by working all night before the day that measurements were to be taken. The other innovation was that of calling in the Y. M. C. A. workers.

The national committee of the Y. M. C. A. placed trained workers at the camp who performed a service similar to that done for the Chinese labor corps in France; in fact some of the workers had served in France. The results were beneficial all around and contributed much to the contentment of the work-

(Continued on page 475)



Worthington pumps draining excavation sumps.



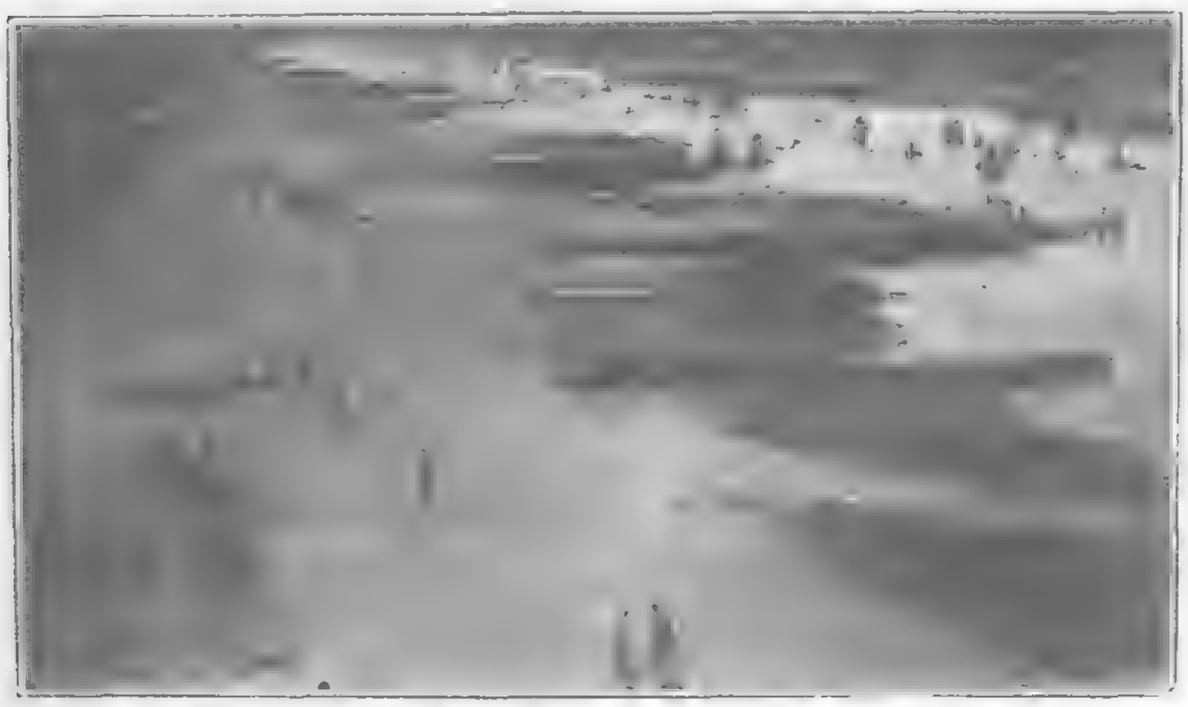
A timber trestle or temporary bridge 800 feet in length was built across the river to aid in constructing dam.



Light railway tracks were laid on the trestle by which 40,000 yards of rock were dumped into the river forming the core of the dam.



Letting the water into the New Channel May 15, 1923.



New Channel a few hours after the water was turned into it.



The next morning May 16, the Yellow River flowed through what 24 hours before was a dry channel and found its way to the sea through the course occupied prior to August 1921.



More than 400 boats were used to transport 14,000 fang of rock from 100 miles up river to the dam.



A newly recruited pai or gang of 30 laborers, a unit in the army of 23,000 workmen, employed on the job.



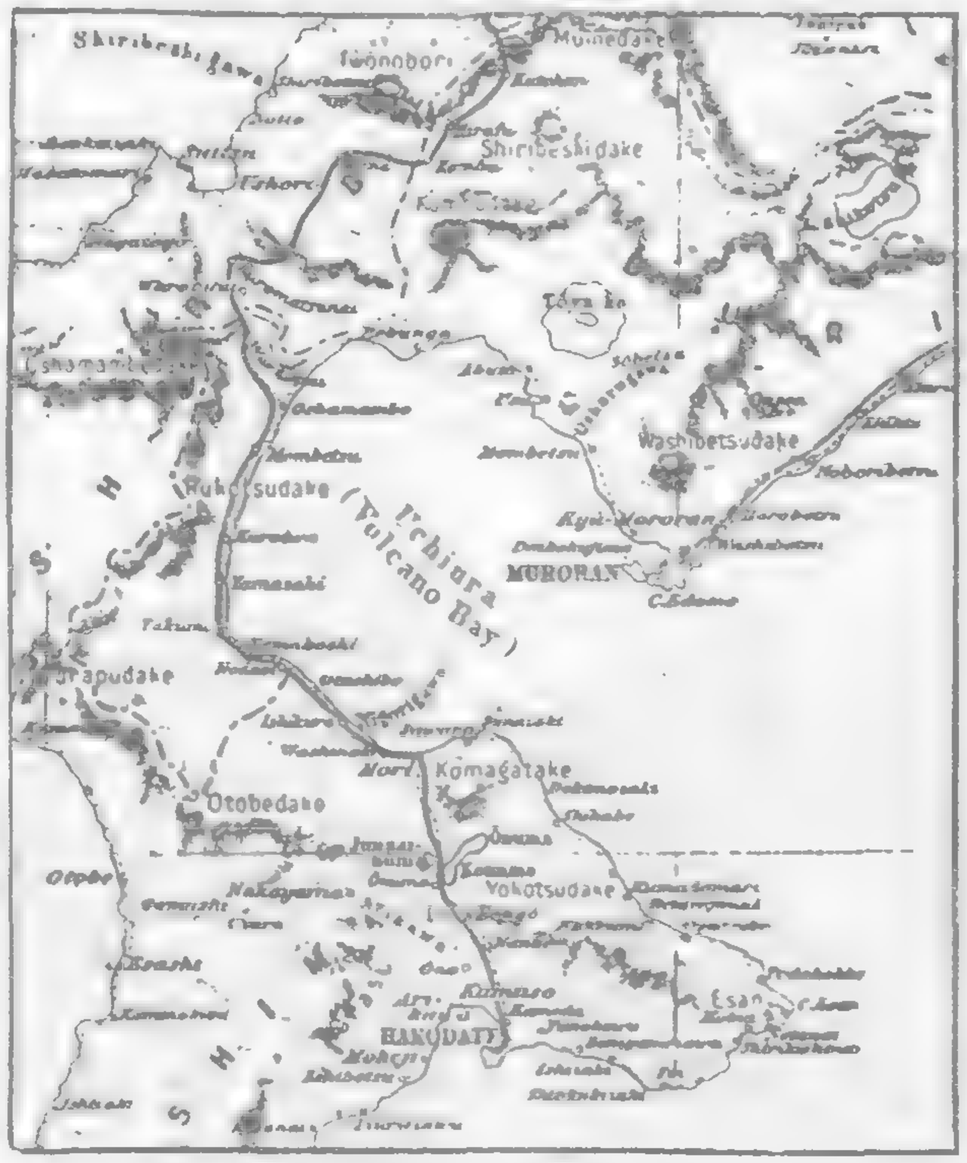
14-inch Gun Manufactured by the Japan Steel Works : Hulse & Co., Ltd., Boring Mill

Japan's Iron and Steel Industry

The Japan Steel Works, Ltd.

IN the March number of THE FAR EASTERN REVIEW the great Japanese government steel works at Yamata were fully described. Next in importance are the Japanese Steel Works at Mororan in the Hokkaido, established in order to supplement the government arsenals in the manufacture of war material at a time when the Anglo-Japanese alliance made necessary some effort on the part of Japan to more better fulfill her share of the obligations imposed by the pact. Up to that time all war material for Japan had been manufactured in the government arsenals but with the stimulus of the alliance and the tendency on the part of other powers to recognize the necessity for private enterprise to assist in maintaining national independence in the supply of munitions in case of war and at the same time meet the trade demands of other nations, Japan also modified her policy in this respect.

The establishment of the Japan Steel Works was the result of the government purchase in 1907 of the whole length of railway under the control of the Hokkaido Colliery & Steamsdip Co. This company, wishing to invest the funds thus received, applied for government permission to establish an iron works. The government was in no position to afford assistance, and the proposal was deferred. At this time Armstrong & Co., and Viekers, Son & Maxim, Ltd., were supplying the country with warships and ordnance, and had frequent consultations with the government with regard to their inventions. These companies combined with the Hokkaido Colliery & Steamship Co. to gain government permission to establish an iron works. As at this time the Anglo-Japanese alliance was concluded, the government gave its consent to the starting of the enterprise upon a co-operative basis, considering that the co-operation of English and Japanese investors would realize effectually the objects of the alliance. Thereupon the representatives of the two companies met in Tokyo on March 7, 1908. and drew up a provisional contract, which was formally concluded in Lon-


Shiribeshigawa
Iwanobori
Muinedake
Shiribeshidake
Toya ko
Washibetsudake
Hukotsudake
Yakumodake
Yobetsu
Kyu-Mororan
MURORAN
Yobetsu
Yakumo
Yakumo
Yakumo

don on July 30 of that year, and on November 1 the first general meeting was held.

Although the details of this contract were never made public, its essential features were disclosed at the time by Mr. Kakugoro Inouye, managing director of the Hokkaido Tanko Kisen Kabushiki Kaisha, and one of the active promoters of the arrangement. He is alleged to have stated :—

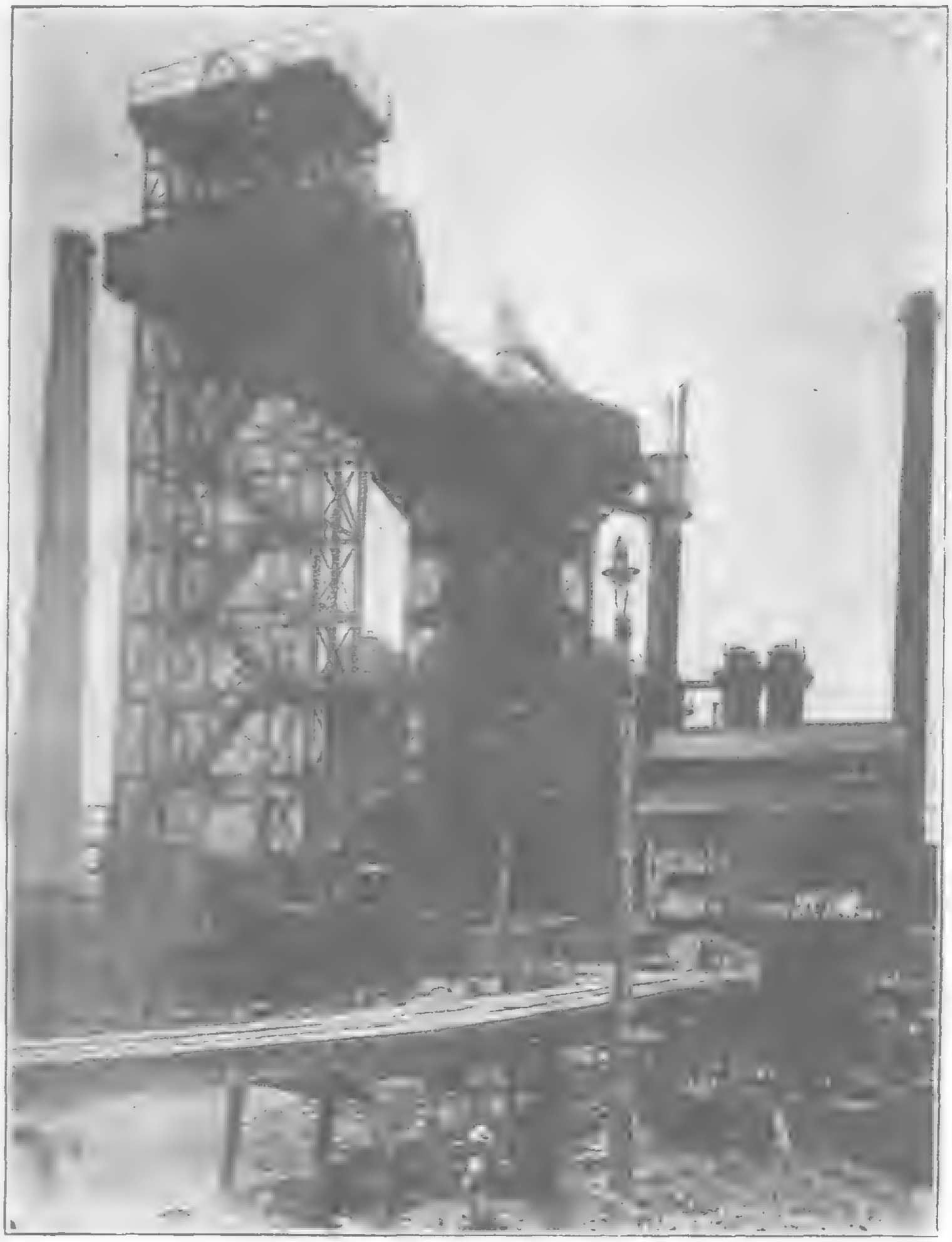
The contract the Hokkaido Colliery and Steamship Company has concluded with the representatives of the Armstrong and Vickers Companies in Tokyo is as follows :—

(1) The Armstrong and Vickers Companies, in co-operation with the Hokkaido Colliery and Steamship Company, will establish a steel foundry in Japan with a capital of 10,000,000 yen.

(2) The Japanese and English companies to produce a half of the capital each, and four directors each.

(3) The Hokkaido Colliery to supply coal and the Armstrong and Vickers to supply iron material and engineers.

(4) Neither party to establish a similar foundry in the Far East.



No. 1 Blast Furnace of the Japan Steel Works

The following supplementary contracts concluded in London provided :—

(1) The new concern to engage in the manufacture of ammunition, and construction of merchantmen ond warships in addition to the making of steel.

(2) For the purpose Armstrong and Vickers to issue debentures to the extent of Y.10,000,000.

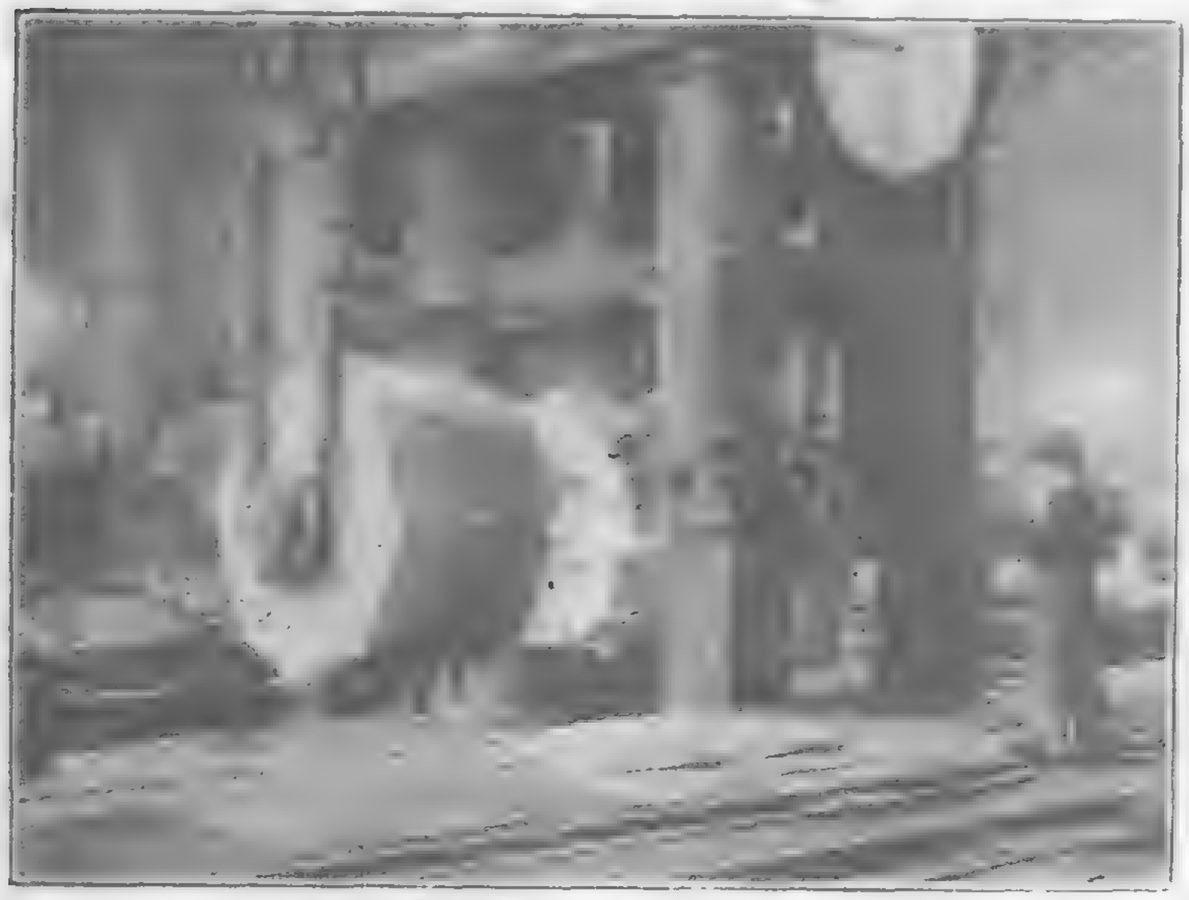
(3) Armstrong and Vickers to abolish their sale agents in the Far East and to transfer the sale business to the steel foundry, paying to it a commission of 2 5 per cent.

(4) The Japanese Steel Foundry to give preference to the above English companies, in case the foundry is about to purchase goods by tender and prices offered are equal.

(5) Mr. Kakugoro Inouye to be president and Mr. Sukemune Kondo to be a director in addition to eight directors mentioned above.

(6) Armstrong and Vickers to assign gratis their technical privileges, secrets, etc., to the steel foundry, and the Hokkaido Colliery and Steamship Company to cede to the concern the building lot at Muroran at cost price.

The foundry was established at Muroran, Hokkaido, for three reasons: First, this site belongs to the Hokkaido Colliery & Steamship Co. Second, it is accessible to coal mines. Third, there are ample facilities to accommodate the company and to lease the space for the navy and army departments. It was proposed to work on the sand ore that lies in such immense profusion around the large, adjacent,



4,000-Ton Hydraulic Forging Press



12-Ton Steam Hammer (Thwaites Brothers, Ltd.)

Volcano Bay. Muroran and Hakodate lie at the two points of the Bay, at the head of which is the volcanic mountain that causes the name. The volcano itself is known as Komagatake.

The greater part of the plant was erected towards the end of 1910 when a domestic bond issue of Y.10,000,000 was floated that enabled the new enterprise to engage in active business in the following January, having been appointed approved Lloyd's makers and sole agents in Japan for Sir W. G. Armstrong, Whitworth & Company, Ltd., Vickers Limited and Hulse & Co., Ltd. The works sprang at once into prominence as the foremost manufacturers of steel products in Asia and aside from its specialty in munitions, it took the lead in steel castings of all sizes and shapes especially for steamship construction. The Muroran works have since turned out naval and military guns of all calibers and descriptions, gun mountings, shells of all kinds, shell-hoists, torpedo air-vessels and ends, aero-motors, etc. Steel castings of all shapes and dimensions, up to 100 tons in weight are cast. The works have supplied the various ship-yards of Japan with stern frames; steam frames; rudder frames: shaft brackets; gun-mountings; turbine castings; engine bedplates; parts for engines; flywheels; generator yokes; motor yokes; anchors; parts for mining and metallurgical machinery; rolls; wheels: etc. etc.



Machine Shop of the Japan Steel Works

Steel forgings of all shapes and dimensions, up to 100 tons :— Engine shafts; pistons; engine parts; turbine forgings; materials for marine purposes; etc. etc.

Iron castings of all shapes and dimensions, up to 100 tons in cast weight : steam cylinders; steam-engine parts : flywheels; rope-pulleys; ingot-cases; machine beds; pipes for waterworks and gas-works; rolls; wheels; etc. etc.

Bronze and brass products of all descriptions, shapes and dimensions, up to 30 tons: Parts and fittings for marine purposes; propellers; valves and cocks; condensers; bearings; submerged torpedo-tubes; phosphor bronze castings for torpedoes; materials for gun-mountings; fuse materials; etc. etc.

Ingots; foundry pigs; basic pigs; otder kinds of pig irons for steel making; managanese iron; Spiegel eisen; etc. etc. Slag-bricks; slag-cement; slag-cotton.

In December 1919, the Japan Steel Works acquired through amalgamation the properties of the Hokkaido Seitetsu Kabushiki Kaisha (Hokkaido Iron Works, Ltd.) capitalized at Y.15,000,000 fully paid up. These works, located at Muroran produce pig iron and control several mines. The capital of the Japan Steel Works was then increased to Y.30,000,000 fully paid, and in 1920 a further domestic bond issue of Y.10,000,000 was floated. The Kabushiki Kwaisha Hiroshima Seisakusho (The Hiroshima Works, Ltd.) located at Kaida-Ichi near Hiroshima with a capital of

Y.1,500,000 being dissolved, the property was purchased by the Japan Steel Works in November 1920. This company specialized in the manufacture of auxiliary machines for naval and military purposes and other miscellaneous tools largely used by the government.

The Muroran Works

The main works, located at Muroran, Hokkaido, have a total area of 1 square mile, 345 acres, 795 yards of which 39 acres, 1,024 sq, yards are covered with buildings. The water for the works is drawn from the Washibetsu River about seven miles distant. The company owns its own loading pier on Muroran Bay, being 1,300 feet long, 60 feet wide and is equipped with a 100-ton wharf crane for loading and unloading heavy castings. In addition the works are served by 34 miles of standard and narrow guage railways belonging to the company connecting with the pier and the government railway system. The works equipment according to the latest published statement of the company consists of following plant :—

Four blast furnaces (three 120-ton and one 80-ton furnaces), 12 hot stoves, 7 blowers, casting beds, lifts, etc. etc.



Casting 100-Ton Ingo : Japan Steel Works

Three D.C. generators, 1,000 K.W. and less, and 22 boilers.

Annual productive capacity of pig iron : 160,000 tons.

The Coal Washing and Coke Making Plants.—Three coal washing plants provided with 826 coke-ovens. Annual productive power : 130,000 tons.

The Smith-Shop.—Total area occupied: 1 acre 99 sq. yds. Steam hammers, 12 tons and less, and reheating furnaces for hammering small forgings, and 1 rolling mill for making bars.

The Pattern-Shop.—Total area occupied : 1,068 sq. yds. All kinds of wood-working machines of the latest design for making wooden patterns for moulds.

The Foundry.—Total area occupied : 4 acres 12 sq. yds. Melting furnaces, 50 tons; two six 25-ton, two 10 tons and two five-ton furnaces all of the Siemens type, the larger being served by two traveling Wellman machines. Besides there are four 6-ton cupolas for iron casting and 20 crucible furnaces for casting brass, gun-metals and other alloys. In the foundry are 5 casting pits, 3 annealing furnaces, 7 drying chambers, etc., that are capable of taking in castings of large sizes ; and of the machines and apparatus installed here, the following may be mentioned as the principal ones :—A wheel-centre cutting and turning lathe. circular sawing machines, bandsawing machines, sand mills, a sand blast, an electric welding apparatus, electric capstans, electric elevators, pneumatic tools for chipping purpose, etc.

Overhead traveling electric cranes in this shop are numerous, their respective capacity being 120, 80, 40, 30, 15 and 5 tons, besides two scrap yard cranes running outside of the shop for transportation of foundry materials, products, and so forth. 120-ton cranes and those of less capacity, ingot-parting machines, etc. etc.

Annual productive capacity of steel : 130,000 tons.

Principal Products.—Ingots for gun forgings and other general purposes, iron castings, cast-steel products of all kinds, and brass, gunmetal and other alloy castings.

The Gas Producer Plant.—40 sets of gas producers of the latest design, supplying gas to furnaces in the foundry, forging shop and tempering and shrinking shop. Coal consumption per day of 24 hours : 250 tons.

The Forging Shop.—Total area occupied: 2 acres 3,760 sq. yds. The interior of the building is divided into three bays; and the shop has three hydraulic forging presses of 4,000, 2,000 and 1,000 tons, respectively, and they each are served by two overhead hydraulic cranes and for reheating furnaces, the cranes provided being of 100-, 50- and 25-ton capacity each for 4,000-, 2,000- and 1,000-ton presses, respectively. These presses are forging gun steels and shaftings and for turning out other forgings, not exceeding 100-ft. in length and 11-ft. in breadth.

There are also in the shop one 650-mm. cogging mill and another 450-mm. rolling mill (they being served by one 10-ton overhead electric crane, one shearing machine, one hot-sawing machine, for straightening machines and three heating furnaces), that are four rolling shell steels for field guns and ordinary round steel bars of 3-in. diameter or less.

An overhead traveling crane, 60 tons in capacity and electrically driven, is also provided for facility in general transportation of materials and manufactures.

Besides the above, here we have one vertical 250-ton hydraulic shell punching press, another horizontal one of the same capacity, and six punching and drawing machines for field-gun shells, and they are employed for punching and drawing out shells for 6-in. or smaller diameter and other steel manufactures of small sizes.

Working : Forgings for guns, shells, shafts, etc., and steel bars.

The Tempering and Shrinking Shop.—Total area occupied: 3,005 sq. yds. 1 oil-tank, 80 feet deep ; 1 pit, 80-ft. deep ; annealing, hardening and shrinking furnaces; one 80-ton hydraulic crane, etc, etc.

Working.—Heat-treatment of gun tubes, shafts and other forgings, and building up of gun tubes.

The Power Station and the Boiler House Attached :—Total area occupied : 3,756 sq. yds. Three 440-volt 1,000-K.W.D.C. Lancashire Dynamo and Motor Co'.s direct coupled with Bellis & Moreom triple-expansion engines and one 200 k.w. W. D. C. generator of same design ; 20 high-pressure B. & W. water-tube boilers with automatic stokers, producing 10,000 h.p. steam. Two sets of economisers are provided for heating feed-water, and four fans to regulate ventilation. The boiler-house is complete with a coal and ash conveyer for coal charging and ash removal, automatic weighers and other necessary apparatus ; and it is replete with all devices for labor saving and economy in fuel consumption.

Working.—Production of electricity for motive power for cranes, machines and machine-tools and for lighting purpose.

The Machine-Shop.—Total area occupied : 6 acres 613 sq. yd.

This is the largest building in the Works and divided into the two sections, the rough machining and the finish machining section ; and machining operations for guns, armaments of all other kinds and others are carried on here.

Equipment.—Machines of more than 500 in total number including ingot trepanning machines, gun boring machines, gun rifling machines, profiling machines, lathes drilling, milling, slotting and surfacing, grinding machines, sawing machines, gun wire winding machines, standard gauges and measuring machines of fine accuracy, cranes for various purposes, 80 tons and less capacity, etc. etc.

Hand finishing for filing work is also performed here.

Other shops : Drawing office : laboratory : slag-brick making shop : fire-brick making shop ; stock main store.

The auxiliary buildings of the Japan Steel Works consist of a hospital, officers' residences, a school and kindergarten. The hospital covers an area of 689 *tsubo*, with acommodation for 80 patients. The general public as well as the Works' officers and workmen can get medical advice and treatment at the hospital.

The five hundred salaried employees and four thousand workmen are housed in 1,200 residences, and provided with complete sanitary and fire-preventive arrangement. The children of the officers and workmen are educated at the school and kindergarten attached to the Works, and a society is established for giving lessons in manual works and moral training to the families of the workmen. Special class rooms and dormitories are provided for apprentice workmen. A club house provided with all amusements and a theatre, with a seating capacity for 1,500 men, cater to the enjoyment of the officers and workmen, as do also green house, a large garden, and a sanitorium erected at the Noboribetsu hotspring, 15 miles from Muroran.

II. The Hiroshima Workshop

This is situated at Kaida-Ichi, near the city of Hiroshima, Hiroshima prefecture, covering 196 acres 285 sq. yds., of which 4 acres 1,633 sq. yds. is occupied by buildings, and over which railways are laid for facility in transportation of products, materials, etc. At the landing ground along the eastern coast a 35-ton floating crane is installed.

The Hiroshima Workshop specializes in the manufacture of shells, 6-in. or less calibre, of all descriptions ; breech-mechanisms ; sighting gears ; gunpowder-cans ; torpedo-tubes ; hydraulic pumping engines ; refrigerating and cooling plants of the Hall's system ; steam cylinders ; ingot-cases ; machines and tools of all kinds.

Steel castings of all shapes and dimensions, ½ ton or less in weight.

Iron castings of all shapes and dimensions, up to 10 tons in weight.

Alloys of all shapes and dimensions, up to 3½ tons in weight.

The general arrangement of the workshop is as follows :

The Machine-Shop.—Total area occupied : 1 acre 300 sq. yds.

The shop consists of two blocks and is divided into the shell finishing, the small machining, the large machining and the erecting section.

Equipment.—Shell finishing machines, lathes and other machines, more than 200 in total number, overhead traveling cranes, etc. etc.

Working.—Erection and finishing of shells, 6-in. and under, various machineries.

The Steam Testing Station.—A water-tube boiler of Yarrow type with the working pressure of 300-lbs. per sq. m. is installed here for conducting steam tests of machineries before leaving premises.

The Tool Making Shop.—Total area occupied : 791 sq. yds.

Equipment : Three salt baths, one electric furnace, tempering furnaces and tool-making machines of various kinds, numbering more than 30 in all.

Products.—Twist drills, reamers, cutters, taps, etc. etc.

The Pattern-Shop.—Equipment : Wood-working machines for making patterns for casting purposes.

The Foundry.—Total area occupied : 3,163 sq. yds.

Divided into the two departments, the Iron Foundry and the Alloy Foundry.

Equipment.—Cupolas, 5 tons and less, crucible furnaces, drying ovens, overhead traveling cranes, etc. etc.

The Smith-Shop.—Total area occupied : 791 sq. yds.

Equipment.—Steam hammers, hearths, hardening and annealing apparatus, etc., for turning out small forgings.

The Boiler-Shop.—Equipment : Plate shearing machines, punching machines, gas welding apparatus.

Products.—Boilers, tanks, etc. etc.

The Copper-Smith.—Total area occupied : 3,954 sq. yds.

Equipment.—Copper-working apparatus, pneumatic tools, lathes, etc., numbering more than 40 in total, of all kinds necessary for copper smithy.

Products—Gunpowder cans, sighting gears, etc. etc

III. Ore Mines

The total acreage of all mine-lots owned by our Company is 136 sq. miles 206 acres 1,684 sq. yds., of which three mines in Hokkaido and one in Chosen (formerly called Corea) are being operated.

There is also the Mejiro laboratory for ferro-titanium.

The company is now capitalized at Y.30,000,000 having its head office at 5 Hon Kawaya Machi, Nihonbashi-ku, Tokyo, with a branch at 112 Dojima hama dori, in Osaka, with Armstrong, Whitworth & Company, Ltd. in England as their agents. The directors of the company are Dr. Takuma Dan of the Mitsui firm, Messrs. T. Mizutani, A. Kabayama, M. Kawabe, T. Isomura, M. Tanaka, D. Awata, S. Eto, T. Makita, N. Ikegami with Douglas Vickers and John Henry Brunel representing the British interests. The auditors are Counts Terashima, N. Ariga and Mr. Saxton William Armstrong.

REPAIRING YELLOW RIVER BREAK

(*Continued from page 469*)

men. A field hut was erected by the Y. M. C. A. Amusements of various kinds were provided including moving pictures, phonographic concerts and lectures. Much was done for the welfare and health of the laborers, the Y. M. C. A. co-operating with the medical and hospital services provided by the company. A sanitary squad was organized and a most thorough daily inspection of the workmen's camps instituted. The results justified the effort. Only three deaths occurred which is noteworthy when it is known that for a period of seven months an average of 10,000 laborers were employed, the maximum number at one time reaching the 23,500 mark.

The foreign staff which varied from 8 to 20 men was housed in comfortable quarters built much like officers army cantonment buildings, an electric light plant was installed. A steam boiler provided boiled water which was run into tanks and filtered ; also it supplied hot water for the baths. During the winter large quantity of river ice was stored. The use of refrigeration boxes enabled keeping meats and vegetables during the hot weather as well as the furnishing of cold drinks.

Much credit is due to His Excellency, Hsiung Ping-chih, civil governor of Shantung, for the manner in which he co-operated with and assisted the company also for the reason that he met all payments promptly on due dates. $1,140,000 was paid by the civil governor and the international famine relief committee assisted by contributing $360,000.

Mr. Paul Page Whitham is president and general manager of the Asia Development Co., which did the work. Mr. L. Fred. Patstone as chief engineer had direct charge of the work and was ably assisted by assistant chief engineer, Irving B. Bush, and the staff of Chinese and foreign engineers and supervisors.

The diversion of the river took place May 15, since which time the dikes have all been completed. The water flowed freely and within a few days the river scoured a deep channel within the old course by which it now reaches the sea, as before the break in 1921.

THE NEW PLANT OF THE E. W. BLISS CO.

(*Continued from page 476*)

Again crossing 1st avenue on this block are housed various activities including blacksmith and drop forging shops, pipe shop, lathe department, machine shop, coppersmith shop and various other general machine working departments. In the foreground is shown the steam power plant and high-pressure air equipment, also a sale water pumping station which gets its supply from New York Bay from a 36-in. main. Salt water is used for condensing purposes and flushing and cooling throughout the plant. This station also includes one 1,000-gallon electrical and one gallon steam fire pump which is connected to the sprinkler systems throughout the entire plant. For fire supply the pumping capacity is equivalent to 5,000 gallons per minute, the fire system is further provided with two four-way Siamese connections on the pier bulkhead for connections with fire boats.

The rectangular tower at the top of the seven story building contains one 50,000-gallon sprinkler tank and one 25,000-gallon mill supply tank.

The New Plant of the E. W. Bliss Co.

THE E. W. Bliss Company of Brooklyn, N. Y., have recently moved their sales and executive offices to their south Brooklyn plant, located at the foot of 53rd street, on the east shore of Upper New York Bay. This plant comprises a group of seventeen buildings covering a ground area of eighteen acres and has a total floor area of twenty-one acres. It has a water frontage of 390 feet at which there are two piers, one being 200 feet long and 80 feet wide and the other 575 feet long and 60 feet wide. There is ample water to accommodate the average size steamship.

During the war many large additions were made to this plant to meet war requirements until it reached its present large proportions. At the termination of hostilities there was available a considerable amount of space and equipment. The Bliss Company determined that the consolidation of their two Brooklyn plants had decided advantages and accordingly have moved practically all the machine equipment from the Adams St. plant to the south Brooklyn plant, using the space made available by the dismantling of the special machinery which was necessary for war requirements.

This plant is reached by the Brooklyn rapid transit fourth avenue subway, a station being located at 53rd st. and fourth avenue (Brooklyn), also by the brooklyn rapid transit fifth avenue elevated, the terminal of which is the New York side of the old Brooklyn bridge. On this line the nearest station to the plant is what is known as the 52nd street station (Brooklyn). The offices which are located on the corner of 53rd street and 2nd avenue are but a few minutes walk from either the subway or elevated station.

The accompanying aeroplane view gives a very good idea of the size of the plant which is 5 feet less than one-half mile long. Beginning at the second avenue end of the plant which is shown on the foreground of the picture there is a three story machine shop, 320 feet by 200 feet, constructed in the form of a hollow rectangle, the court of which is 200 feet by 80 feet and is used as an erecting shop while the balance of the building is used as a machine shop. The erecting shop is served by a number of electric traveling cranes and auxiliary hoists. On either side of the building are five-ton steel cranes to serve the planers and lathes.

Next in the picture is the hydraulic forge shop which is a one story building 125 feet long and 200 feet wide and is served with two 10-ton and one 30-ton overhead electric traveling cranes. The equipment in this shop consists of furnaces, steam hydraulic forging hammers and forging presses ranging from 200 to 1,000 tons pressure. The water supply and pressure is obtained by eight hydraulic pumps each being driven directly by one 350 h.p. general electric motor which in turn supplies two 16-in. 200-ton accumulators. The pumping equipment is controlled by an automatic switchboard which is operated by the position of the accumulators.

Next in order is the automobile die department, a one story concrete building 200-ft. by 180-ft., and the last shown in this block in the picture. A storage yard having a railroad siding completes the space in the block between 2nd and 1st avenues. This yard is used chiefly for loading and unloading of cars serving the group of buildings above described, a 5-ton locomotive crane being used to accomplish the purpose.

On the far side of 1st avenue is a one story brick and steel building 320-ft. by 200-ft. This building is fitted with numerous skylights which give an ideal lighting condition within. Between this and the seven story building at the centre of the picture are various minor buildings such as plating, pickling, grinding, and small tool houses, also two 100,000 gallon fuel oil storage tanks. This is the primary supply of oil for the boilers and furnaces used throughout the plant and is fed by a main line running from the pier to these tanks so that they may be filled directly from the barges.

Prominent in the rear of the picture is the seven story machine shop and the erecting shop. The machine shop itself is a brick and steel building 380-ft. by 60-ft. The first two floors are served by five ton overhead electric travellers, both the lower stories having been made sufficiently high to accommodate these tools. The entire building is used for manufacturing purposes.

Immediately to the left and adjoining this building is the main erecting shop, having an 80-ft. span and being 380-ft. in length with clear overhead distance of 50-ft. and in which are houses all of the large planers up to and including those having 12-ft. capacity and 26-ft. stroke. The main erecting floor and the machine tools are served by four overhead electric travelers, two of which are 50-ton capacity and two of which are 30-ton capacity, each equipped with auxiliary hoists.



The New Plant of the E. W. Bliss Company at South Brooklyn, N.Y., U.S.A.

Beyond this building and up to the bulkhead line is the main foundry which is 240 ft. long and 180-ft. wide. The foundry obtains its iron from two 84-in. and one 54-in. diameter cupolas. The equipment includes three core ovens 20-ft. wide, 30-ft. deep and 10-ft. high (oil fired), sand miners, jolt ramming machines and four-ton wall travelers. In the centre of the foundry there is a pit properly water proofed, 60-ft. long, 14-ft. wide and 10-ft. deep, which is used for making deep castings. This foundry being built at tide water level it was necessary to construct such a pit to exclude water from the moulds.

The half block line if buildings on the right of the picture begins about half-way between 2nd and 1st avenues with various minor shop buildings, including a garage having an area of 10,000 square feet.

(Continued on page 475)

Shanghai Municipal Electric Plant

20,000 k.w. Metropolitan-Vickers Turbo-Alternator

THE local government of Shanghai is in the hands of the municipal council which is international in character and in the matter of electric supply has conducted the affairs of this town in a very progressive manner. The council purchased the undertaking from a private company in 1893. In 1896 a new station was built at Fearon Road. The total capacity of this station in 1901 was 550 k.w. but this was gradually developed by Mr. T. H. U. Aldridge, M.I.E.E., M.I.MECH. E., FEL. A.I.E.E., who was appointed engineer-in-chief and manager at this time, until the station contained altogether about 5,600 k.w. of plant.

By 1910 the load had grown to a maximum of 3,240 k.w. with an annual output of 6,530,643 units sold, and it was decided to build a new station on the Whangpoo River at Riverside. The original station at Fearon Road generated direct current for street arc lighting, and single-phase alternating current, 2,200 volts 100 cycles for ordinary supply. In 1904 the system was changed to 50 cycles. The first two 1,000 k.w. single-phase turbo-generators installed in 1906 and 1907 were subsequently re-wound for two-phase operation 2,000/2,000 volts. The remainder of the single-phase generating plant was operated in proportion on each of the two phases. In order to meet the growing demand for electric power, it was necessary to start three-phase distribution, and this was effected by means of Scott connected transformers.

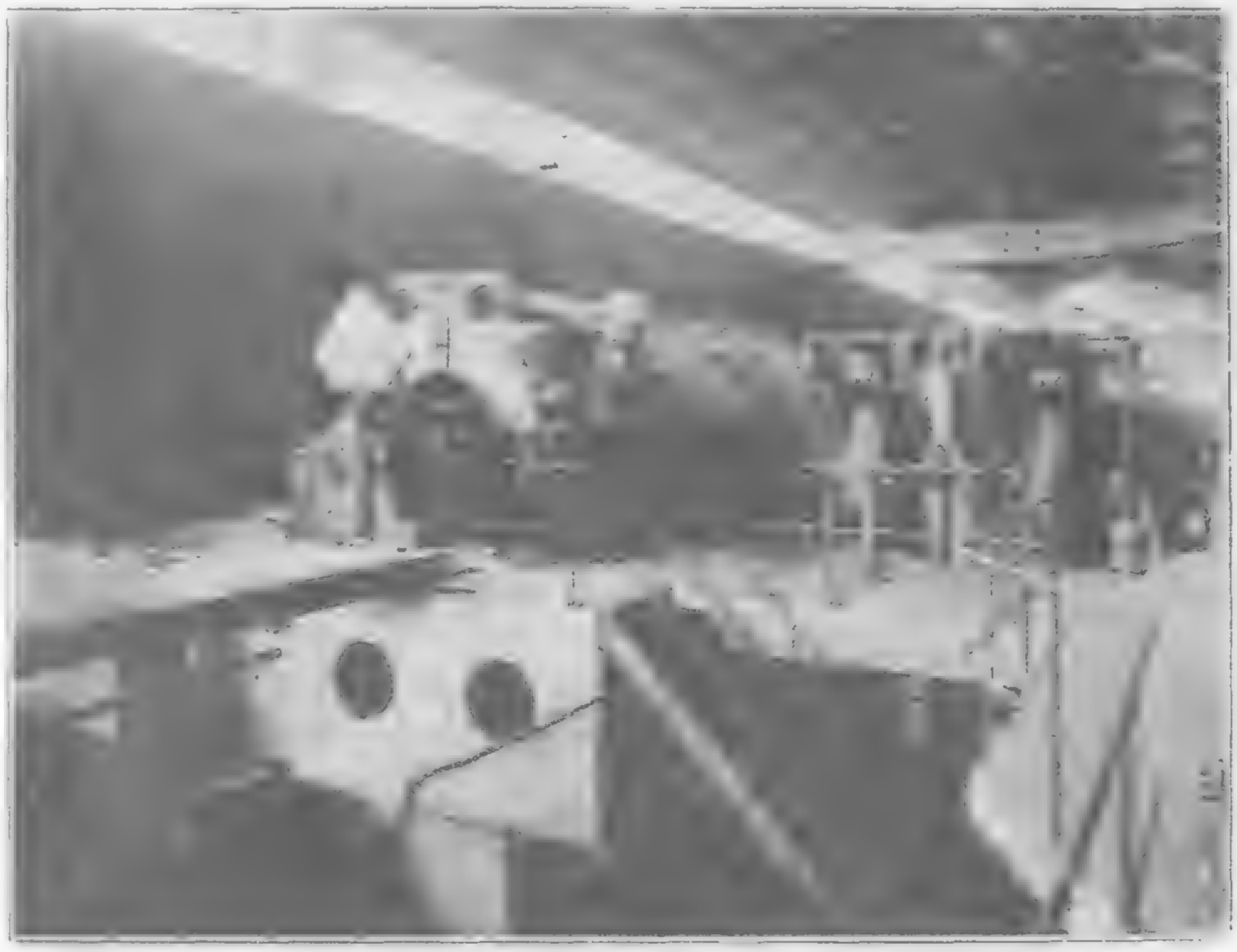
All the plant at the Riverside station generates at 6,600 volts, three phase and 50 cycles, but the additional generators supplied in 1916, and those supplied under the present extension are directly connected to "Step up" transformers working at a trunk distribution pressure of 22,000 volts. The first section of the new station at Riverside contained at the end of 1914 14,000 k.w. of steam turbine plant, and as the output in 1915 amounted to 49,787,397 units sold with a maximum load on feeders of 13,909 k.w. further plant was required, and three turbines of an aggregate capacity of 25,000 k.w. were ordered for this extension, known as the 1916 extension. The first set was running in October 1917 and the constant increase in load during that year amounting to 79,600,000 units caused the management considerable difficulty as the manufacturing countries were engaged in the great war, and there were many obstacles in the way of getting a new plant.

Orders were placed in 1917 and 1918 for plant with a capacity of 36,000 k.w. and in 1919-20 a further 40,000 k.w. of generating plant was ordered. The output of the station which was 49,789,397 units in 1915 had risen to 102,338,137 units in 1919.

The extensions ordered in 1917 and 1918 were supplied by the General Electric Company of America, and consisted of two 18,000 k.w. turbo-generator sets but capable of developing 20,000 continuously at slightly lower efficiency. When these orders were placed British manufacturers were unable to offer any definite time of delivery as their works were under the direct control of the ministry of munitions.

During the war considerable trouble was experienced with the two 5,000 k.w. units of German manufacture which were set to work in 1914, and it was decided to replace them by a 10,000 k.w. set by the General Electric Company of America, ordered in March, 1920. By this time English firms were in a better position for dealing with such a contract, and the 1920 extensions consisting of two 20,000 k.w. turbo-alternators with condensing plant and two 3,000 k.w. house service turbo-alternators with condensing plants, and also three 750 k.w. rotary convertors were ordered in England.

One of the large alternators was placed with Messrs. C. A.





Two Views of the New 20,000 k.w. Metropolitan-Vickers Turbo-Generator for the Shanghai Municipal Electric Plant. Top, Steam End

Parsons & Company with condensing plant by Messrs. Hick Hargreaves & Company, and the second 20,000 k.w. set and condensing plant and two 3,000 k.w. house sets were placed with the Metropolitan-Vickers Electrical Co., Ltd.

The 20,000 k.w. turbine supplied by the Metropolitan-Vickers Electrical Company runs at 1,500 r.p.m. and has 14 Rateau stages. Steam is supplied at 180-lbs. pressure at the stop-valve and superheated to a total temperature of 572 deg. F. The turbine is designed for a vacuum of 28.75 inches. The set is capable of developing an overload of 25 per cent., i.e., 25,000 k.w. for two hours.

The nozzle boxes and parts subjected to full steam pressure and superheat are of cast steel. The main cylinder is of cast iron proportioned and stiffened to minimize the effects of unequal expansion. One end is fixed to the bed plate and the other free to expand along guides. The moving blades are of nickel steel machined out of the solid. They are fixed to the wheels by straddling and double rivetting. The fixed blades are of mild steel. Lubrication is effected by means of a main oil pump driven from the main shaft, capable of delivering 100 gallons per minute with an oil pressure of 7-10-lbs. per square inch. An auxiliary steam-driven pump is supplied to flush the bearings on starting. There are four main bearings of the adjustable self-alignment type with adjustable pads on the top, sides and bottom. Each bearing consists of a cast iron shell divided horizontally and lined with white metal.

The turbine is provided with a main control centrifugal governor which can be adjusted by hand or electrically from a distance and in addition the turbine is provided with emergency governors which come automatically into operation and operate valves to shut off steam completely if the speed of the turbine rises 10 per cent. above the normal. These valves can also be operated by hand from the engine room floor or from the switchboard control room by means of a solenoid.

The condenser has an area of tube surface of 40,000 square feet, and 40,000 gallons of cooling water per minute are required. Each set of air and condensate pumps, of which there are two, require 40 h.p.

The condenser is capable of maintaining a vacuum of 28-in. in the turbine exhaust when the turbine is under continuous full load when the temperature of the inlet water does not exceed 80°F. and 28¾-in. of vacuum when the inlet water does not exceed 65° F. the barometer standing at 30-in. in each case.

The turbo-generator has a stator built of steel stampings in a cast iron frame. It has a solid rotor and the radius of clearance between the stator and the rotor is $\frac{7}{8}$-in. The collecting rings are of steel with 20 brushes per ring. The turbo-generator is fitted with an enclosed air circulating system in which the air cooler has a capacity of 60,000 cubic feet per minute. The capacity of the direct coupled exciter is approximately 60 k.w. at 180 volts. The coupling bolts between the generator and turbine are designed to shear in the event of a dead short circuit.

The weight of the complete set without condenser snd auxiliaries is approximately 232 tons. The set was put in hand in October, 1920, the condenser being despatched in November 1921, the turbine in January 1922 and the alternator in June, 1922.

The two 3,000 k.w. turbo-alternators are for station service and give their output at 80 per cent. power factor at 6,600 volts, 50 periods and 3,000 r.p.m. They are, however, to be connected to the 22,000 volt system through a floating transformer so that if the house turbines are not running the auxiliaries can be run from the main alternators. Normally, however, the auxiliary supply is derived from the house turbines and the floating transformer merely used for the transfer of load from the house turbines to main busses or *vice versâ*, the principal object being the attainment of a correct heat balance on the house turbine plant condensers functioning as feed water heaters. The steam pressure at the stop valve is 180-lbs. the steam is super-heated to a total temperature of 572 deg. F. The highest efficiency is obtained when exhausting into a condenser maintaining a back pressure of 7-lbs. per square inch absolute. The condensate from the main sets is used as circulating water in these condensers and its temperature thus raised to approximately 170° F. The condensers for the service sets thus act as feed water heaters and great economy is effected in this way as much of the heat which would normally be carried off in the circulating water is returned to the boilers.

The nozzle boxes and parts subjected to high steam pressure are of cast steel and the cylinders of cast iron. The bearings are standard and self-aligning with adjustable pads in the tops, sides and bottoms, divided horizontally and lined with white metal keyed into position.

There is one velocity stage followed by five Rateau stages. The lubrication is maintained by oil pumps capable of delivering 25 gallons per minute at a pressure of 7-10-lbs. per square inch.

The generators have solid rotors and the clearance between the rotor and stator is ¾-in. Both sets are fitted with ventilation fans and air coolers. The capacity of the air cooler in each case is 14,000 cubic feet per minute. The direct coupled exciter on each set has an output of approximately 25 k.w. Thermo couples are fitted for measuring the temperature in the stator. The complete weight of each turbo-alternator is 44 tons.

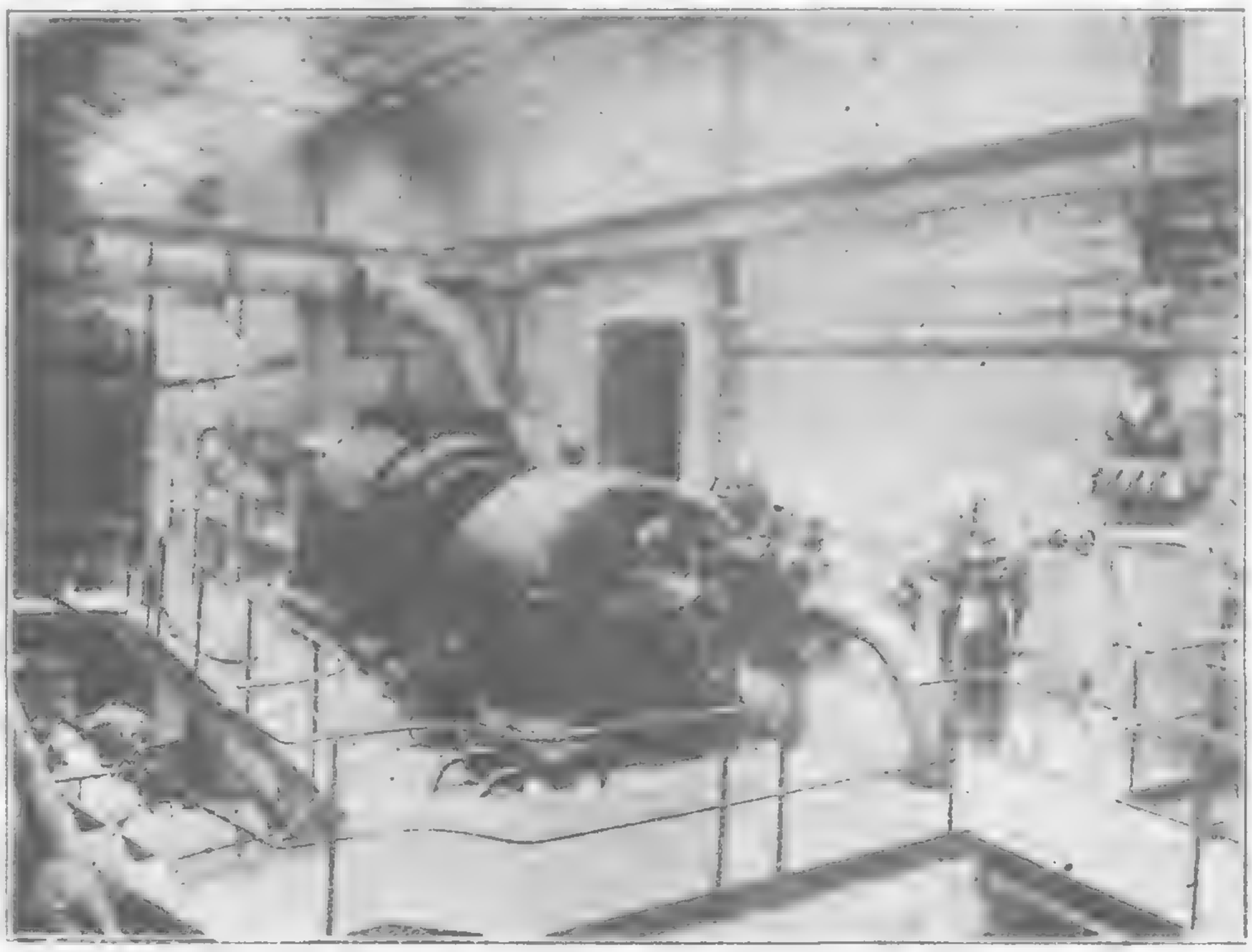
The three 750 k.w. rotary converters are of the self-synchronising type 6-phase, 50-period, running at 750 r.p.m. and giving 440/450 volts on the D.C. side. Each rotary converter is fitted with a starting motor and speed limiting devices.

Three 825 KVA transformers, of the oil insulated self-cooled type in boiler iron tanks with rollers, transform from 6,600 to 316 volts 3-6 phase. The temperature rise does not exceed 80 deg. F. when measured by thermometer in the hottest part of the oil or 90 deg. F. when measured by resistance.

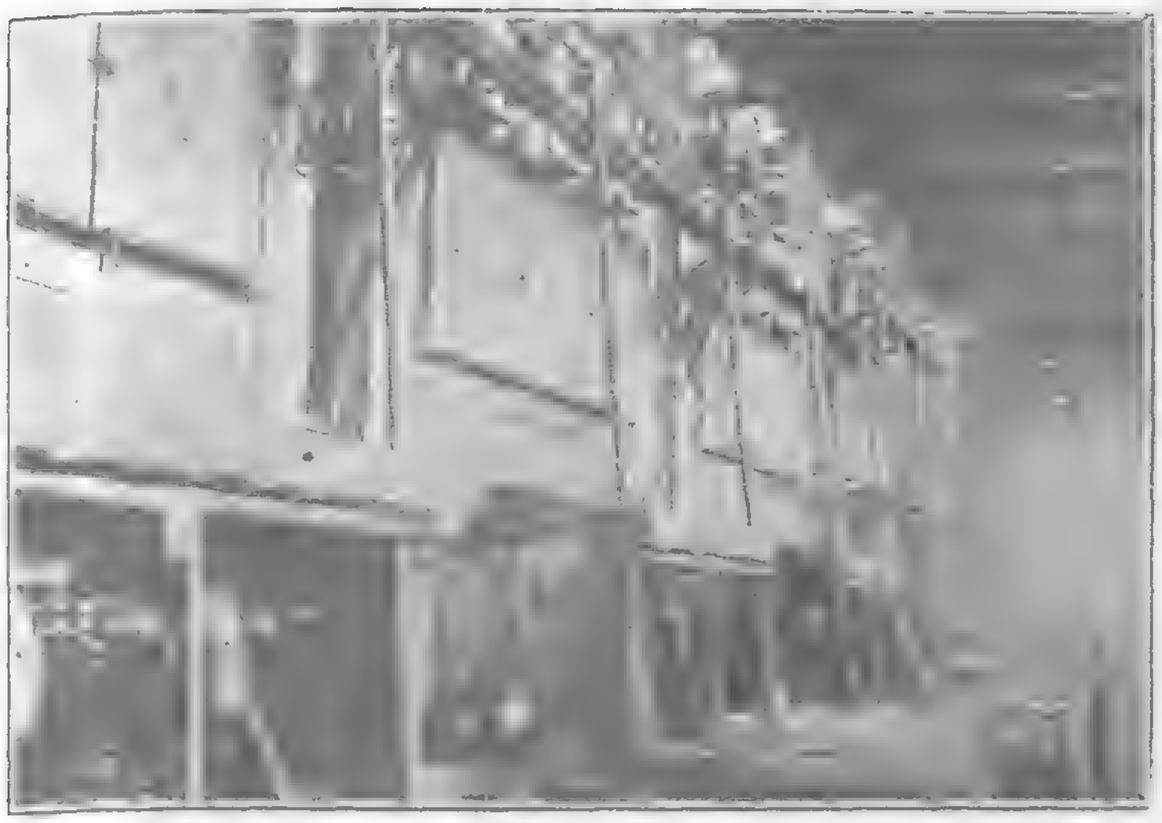
The starting panels are of enamelled slate and contain one 3-pole single-throw switch for the main circuit, one 3-pole double-throw switch for the starting motor, one single-pole field discharge switch and resistance, one moving coil voltmeter marked as a polarity indicator, one push button switch and one set of indicating lamps.

A battery of 10 new boilers, each having a normal evaporation of 80,000-lbs. of water per hour, has been installed to provide steam for this extension. They have superposed steel economisers and the steam pressure is 200-lbs. per sq. in. The coal consumed is either Chinese or a mixture of Japanese and Manchurian dust containing a large percentage of ash and moisture. Modifications have been introduced in the design of the boilers and mechanical stokers to make them suitable for this low-grade fuel.

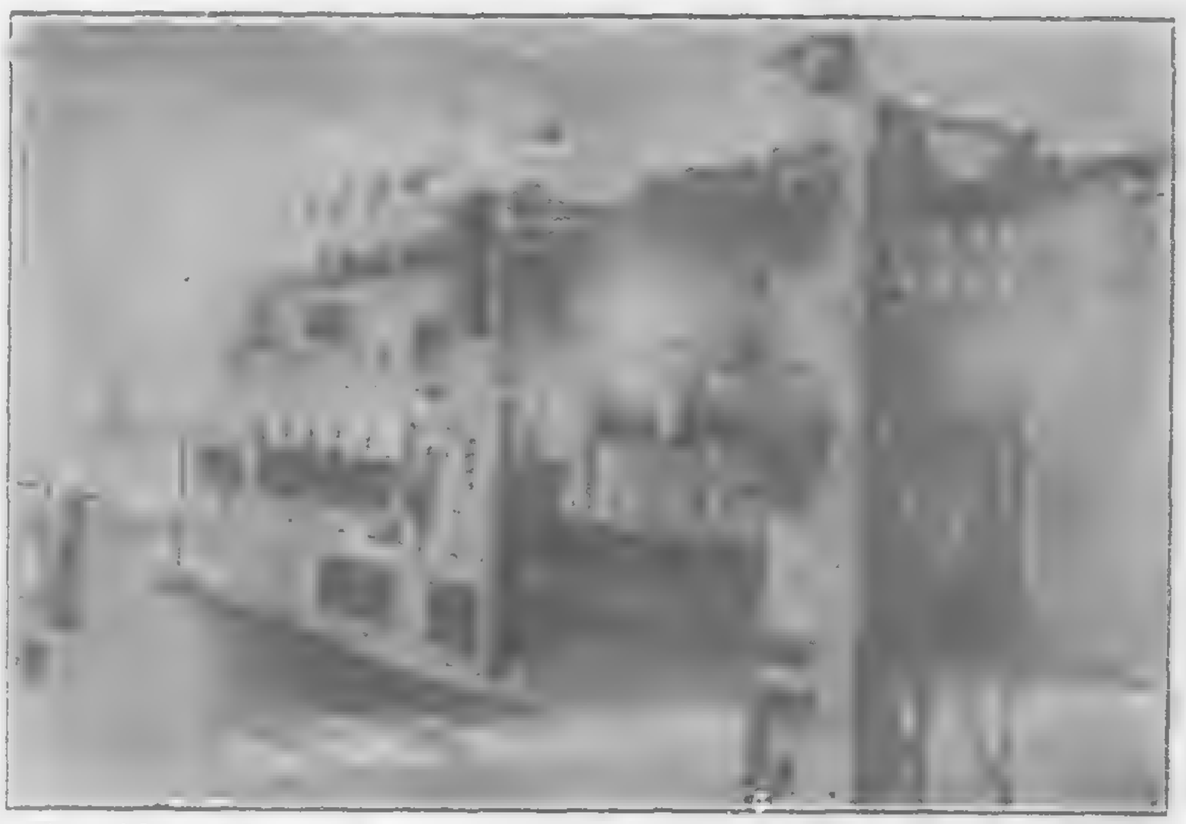
The whole of the layout of the extensions was designed by Mr. Aldridge and his staff in Shanghai, upon whom rests the entire responsibility.



One of the two 3,000 k.w. Metropolitan-Vickers House Turbo-Generators for the Shanghai Municipal Electric Plant



Boiler Room; 4 Babcock and Wilcox Water Tube Boilers with Westinghouse Stokers



Switchboard Bay : All appliances made by the Shibaura Engineering Works

The New Amanogawa Power Plant at Dairen

Operated by the Electricity Department of the South Manchuria Railway Company

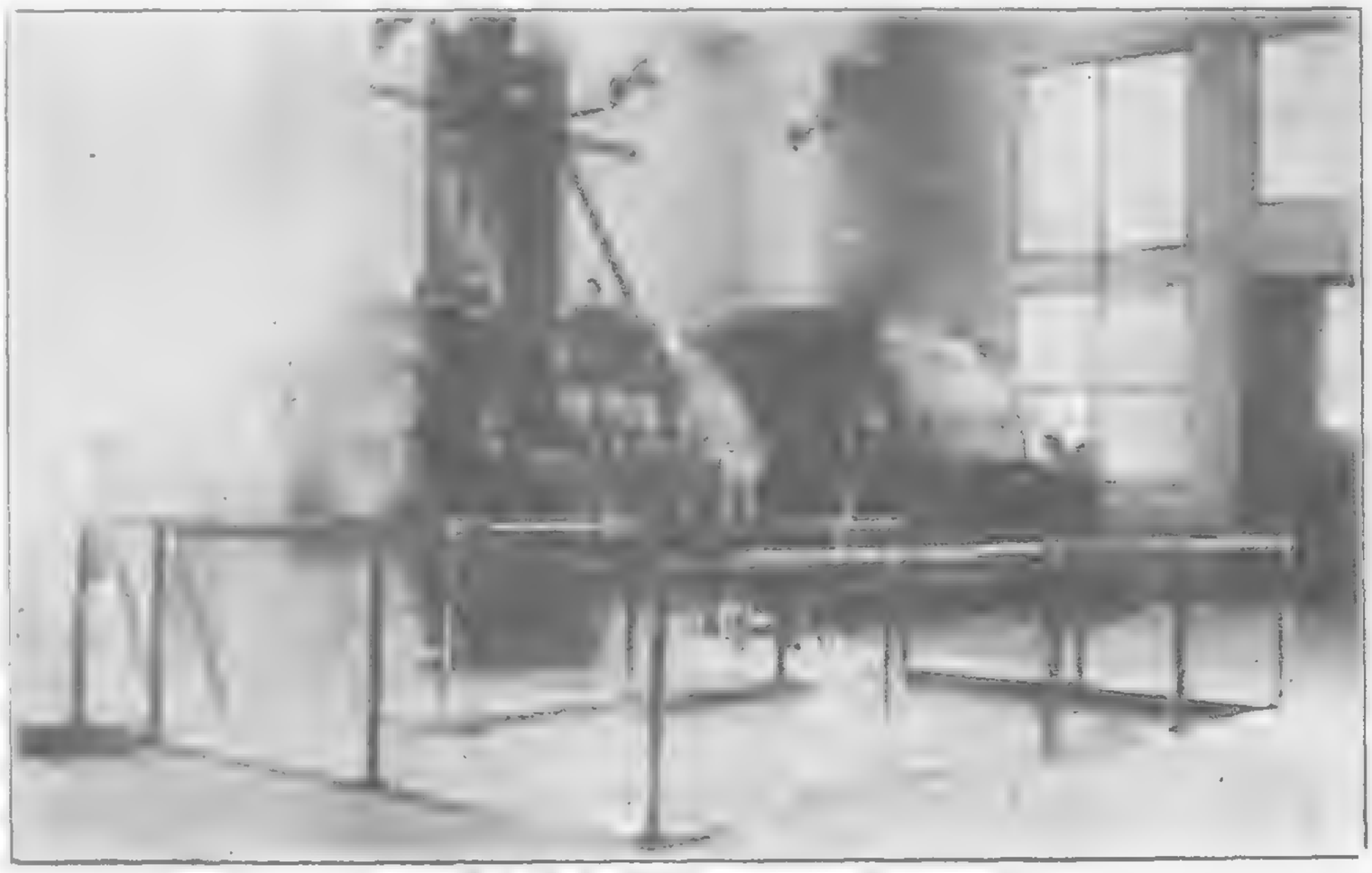
ON the main road from Dairen to Hoshigaura and near the waterworks is located the new Amanogawa power station designed and built of reinforced concrete and steel to house a plant of 30,000 kilowatts.

This building was commenced in June, 1919, and in November of 1922 the test runs were made for the first unit. The building itself is one of the best examples of reinforced concrete and steel structures to be found in the Far East, designed on the most approved lines of power house construction, in which provision has been made for the installation of all modern coal handling and saving appliances, which, however, are not to be installed until the second or third unit is in place.

Adjoining the generating room is the boiler-house designed for about 8,000 horse-power. The initial installation consists of four Babcock and Wilcox water-tube boilers of which three are of 7,135 and the other of 8,282 square feet of heating surface, with 144 and 168 sq. feet of grate surface respectively, and equipped with Westinghouse stokers. The boiler feed is supplied by two vertical Weir pumps with closed type heaters, while forced draft is supplied by two turbo-condidal fans from the Buffalo Forge Company driven by Westinghouse motors.

For the present coal is handled by coolies as being most economical, but with the installation of further units conveyors will carry the coal to overhead bunkers with gravity discharge into weighing lorries and feed shutes.

In the generating room, floored with white glazed tiles, is found the first of the four units for which the building has been designed. The one in place is a Westinghouse turbo-alternating set of 6,250 K.V.A., 11,000 volts, 50 cycles, operating at 3,000 r.p.m. with direct connected exciter of 45 kilowatts, 125 volts. A second unit of the same size is to be installed and as fast as consumption of power and light warrants, the other two sets will be added. The switchboard bay is equipped throughout with instruments, switches, transformers and other appliances manufactured by the Shibaura Engineering Works of Tokyo.



5,000 K.W. Westinghouse Turbo-Alternator



General View of the Amanogawa Power Station

First Telephone Co. Toll Cables in Japan

(Continued from page 487)

This cable, with the necessary loading coils, is now being manufactured at the Hawthorne Works of the Western Electric Company at Chicago. It will be of the quadded type and consist of 54 pairs of No. 16 A.W.G. conductors and 130 guaranteed pairs of No. 19 A.W.G. conductors. All of the No. 19 gauge circuits will be suitably arranged for 4-wire operation, the No. 16 gauge conductors being used for 2-wire operation only.

Japanese telephone engineers have shown great interest and a keen insight in the recent advances which have been made in the art of long distance telephone cable transmission. The decision of the government to undertake construction work of this nature will materially assist in the creation of an adequate toll line plant and will place Japan among the foremost countries of the world in the development and operation of long distance telephony.



The Hidachi Copper Mine of the Kuhara Mining Company, one of the four largest producers in Japan, situated near Sukegawa, Ibariki Prefecture

Copper Ores in East Asia

Extracted from a Monograph on Copper Ores by Robert Allen, M.A. (Cantab.), B.Sc. (Lond.), M. Inst. M.M. of the Imperial Institute. Published by John Murray, London

China

THE mining of copper in China has always been strictly controlled by the government, as copper is an important medium of currency. The metal is imported as production is insufficient to supply the needs of the country.

According to V. K. Ting, director of the geological survey of China, there are many deposits of copper in China, but not many are of value. The deposits occur as (1) *magmatic segregations*, (2) *contact deposits*, (3) *replacement deposits* and *fissure veins*, (4) *impregnations*, and (5) *sedimentary deposits*.

The first are seen in the Permian basalt of Yunnan, which covers great areas. All are small and irregular. Similar deposits occur in the Teriary porphyries of North Chihli. The contact deposits, always associated with iron ore, are due to contact action of diorites. They are found in South Hupeh, in the districts of Shing Kuo and Yangshing, and are of small economic importance. The government is working a contact deposit at Pangshih in Kirin, which contains 10 per cent. ore, but is small. Important replacements, occurring as stockworks in limestone, and as fissure veins in shale, are found in the famous Tungchuanfu mine, Yunnan, where the ore contains over 8 per cent. copper, and in the Hueili district of Szechuan.

Low-grade impregnations are found in the pre-Cambrian crystalline rocks of South Shansi and N.W. Hupeh. The government is working a similar deposit at Penghsien, near Chengtu (Szechuan), where the ore-bodies consist of large lenses in crystalline schists and limestones, and contain about 5 per cent. copper.

The sedimentary deposits in Yunnan and in Kweichow are of interest: the lower Triassic sandstone overlying the Permo-Triassic coal measures, always contains some copper, principally as malachite.

According to Chas. H. Hansen great mineral wealth lies within the border of the province of Kansu, but prospecting is very difficult, as the rocks are covered by a capping of fine sandy loam (*loess*), up to 200-ft. in thickness, supposed to have been blown over from the Gobi Desert. At one place he erected a copper smelting furnace, with a capacity of 50 tons per day, there being good fluxes and coal near by. Access is difficult as the roads are of the worst possible type.

According to H. W. L. Way, there are extensive aboriginal workings on th Ko-Lo-Lo copper mine, four miles north of Maha, Szechuan, and there are a number of derelict stone blast furnaces in the valley below, but the mine has not been worked within the memory of man. Copper-bearing veins occur at Lo-Ko-Ti, about 12 miles N. W. of Maha ; and at Hui-Lung-Chang, 30 miles N. E. of the same place, 90 smelters worked very prosperously until 15 years ago, when the Chinese were driven out by the Lolos.

The copper mines of the province of Yunnan have been described by J. Coggin Brown. In N. E. Yunnan the Lou Pou mines in Carboniferous prophyry yield a small production, and, near the village of Ta-Me-Ti, are several copper deposits, the most interesting of which is Lao-Sin-Chang. It is a kind of stockwork in cracked and brecciated limestone, and the primary chalcopyrite has been altered to carbonate with concretions of barytes. The ore from Lao-Sin-Chang was almost entirely chalcopyrite, and that from Pe-Si-La was mainly bornite with a little covellite. In E. Yunnan, the deposits at the Tien-Pao mine, near Pe-Tchen, consist of three interstratified ore-bands with a sandstone floor and a shale roof. Only one seam is being worked. The ore, in the form of balls, is chalcopyrite. The Wei Tou Chan mine is on a thin vein following an irregular fissure in an eruptive rock, carrying quartz rich in bornite, chalcopyrite and pyrite. The Yung Pei Ting district, N. N. E. of Ta Li Fu, was inspected by J. Coggin Brown. He believes the veins were in very irregular fissures, very varied in size and shape, crossing shales, sandstones and limestone, and entering the eruptive rocks in contact with them. The output is at present small. The San Chia Chang copper mine, S. W. of Yunnan Fu, in the upper valley of the eastern head waters of the Red River of Tongking, was also visited by J. Coggin Brown. The ore is chalcopyrite, with small amounts of enriched sulphides, in limestone, which is much broken near its contact with slates.

Copper mining was formerly of importance in Yunnan. The decline in the last 50 years is due to depletion of rich surface ore, to political troubles, to lack of charcoal fuel due to the destruction of forests, and to transport difficulties. There are government mines in the Tungchuanfu region, already referred to, which yield an output of about 1,000 tons per annum. One of the mines dates from 1697, and the output from five groups of mines formerly amounted to from 4,500 to 9,000 tons per annum. The Mohammedan rebellion in 1858 stopped all mining in Yunnan. There was a revival from 1874, and the mines reverted to the government in 1907. The government also has copper mines in the Penghsien district, near Chengtu, Red Basin, and in Huilichow, 115 miles south of Maha, Szechuan ; at Ch'ang Pailing, Kiangsi, and works at Yaokai, Kansu. The Ching Hua Mining Co. is working in the Nanchang district, Hupeh, with a modern foreign equipment.

Copper also occurs in the provinces of Shantung, Hunan, Anhui, Kweichow and Kwangtung.

In Manchuria copper is found, but apparently not worked, at Tunghwasien and at Maoerhshan near the Korean border east of Moukden ; also at Pensihu, at Tienpaoshan, at Chaimachi and at Shisuitze. According to Rockhill, copper is found and slightly worked in S. E. Tibet.

The difficulties of mining for foreigners in China are described by W. F. Collins, E. Gilmour Brown and J. A. T. Robertson. If foreigners desire to engage in mining they can do so by forming joint companies with the Chinese. half of the shares being held by Chinese. In some places, such as the province of Hunan, the presence of foreigners is not desired. In some parts large portions of the mineral wealth are locked up in concessions. The important mineral province of Yunnan is under French control.

The yearly output of copper in China is about 2,000 tons at present, one-half of this coming from Yunnan, the balance, from Kirin, Kansu and Turkestan.

Recent imports of unmanufactured copper are as follows :

	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
Metric tons	19,853	3,089	1,575	1,672	7,339	19,210	25,190	28,925

Dutch East Indies

Celebes.—Copper ore has been found near Gorontalo, and is being worked by natives

Dutch Borneo.—Ores of copper are fairly uniformly distributed near Mandor, Montrado and Budok, West Borneo. Copper ore is found occasionally disseminated in gold and pyritic quartz veins in slate and granite, and small veins containing pyrite and chalcopyrite occur in argillaceous sandstones. In the Tampi Mts. there is a zone of weathered clay-slate 40-ft. wide, impregnated with pyrite and chalcopyrite, and traversed by several small ore-bearing veins, which, however, die out at small depths. In the same mountains native copper has been found in auriferous drifts. The Chinese and native gold-washers have long known that native copper is sometimes associated with gold sand ; indeed, copper ore is said to have been, at one time, a by-product in gold-washing. Near Salothong, copper ore is found in granite for a width of 16-ft., either in small veins or scattered through it in nests and impregnations. At greater depth the quantity of ore diminishes. Near Skanah, granite is traversed by veins of chlorite nearly 2-ft. in thickness, containing chalcopyrite and blende. In the deserted gold mines of Man Fo Pie and Ko Pie Then, veins impregnated with chalcopyrite are scattered over a clay-slate district. Some of the veins consist almost entirely of chalcopyrite.

Dutch New Guinea.—The presence of copper has been reported near Biri River in the north-east of Dutch New Guinea.

Dutch Timor.—A rich copper deposit has recently been found near Taninj, about 20 miles from Tjamplong, Dutch Timor, the ore being reported to be worth from £25 to £40 per ton at the then existing rate of exchange.

Java.—It is believed that copper ore exists in large quantities in Java. It is found at Madiun and at various places in the Preanger Highlands, but has been mined nowhere scientifically.

Sumatra.—Copper ore is said to be plentiful in the Paningahan Valley, west coast of Sumatra, but has not been worked. It is found also on Nias Island off the same coast.



The Ashio Copper Mine of the Furukawa Mining Company

French Indo-China

Louis de Saugy has described the copper ore occurrences at Van Say, on the Song-bo (Black R.) a tributary of the Song-kio (Red R.), Tongking. Five nearly vertical veins, striking N. N. W. to S. S. E., occur on the right bank of the river. The veins, covered by a shallow gossan, vary from 1½ to 5-ft. in thickness, and contain carbonate ore followed by unaltered sulphides. To the north on the left bank of the river is the outcrop of a similar vein, 1½-ft. in thickness, and rich in copper. Copper ore outcrops to the south at various places on the left bank, both oxidized and sulphide ores being present in gangues of ochreous schist, quartz (often auriferous), chlorite and dolomite. Quartzose ores assayed 12 to 27 per cent. copper ; schistose, 18 to 31 per cent.; and dolomitic ore, 6 per cent. The average content was about 16 per cent. copper. The gold contents varied from a trace to 27 dwt. per ton ; the silver, up to 4 dwt. per ton. Saugy thinks the exploitation of these deposits should be remunerative. Copper ores have been found by natives at several places in the province of Tranninh, Tongking, but the deposits have never been exploited.

Copper mines are worked by natives in the province of Kwang-nam, Annam. Copper ores have been found near Vien-Tiane and at Savanakhet, Laos, and in the lateral valleys of the Mekong River.

In 1919 there were nine copper mineral concessions in Indo-China.

Recent exports of copper ore from Haiphong, Tonking, are as follow :

	1910.	1911.	1912.	1915.
Metric tons	32	29	55	67

Japan and Formosa

Japan.—Copper mining in Japan dates from the year 708, when copper was found in the province of Mushashi. The copper produced was used to a small extent for minting purposes, but mainly for casting bells and images for the temples. Early in the fifteenth century a considerable amount of copper for that time was exported to China, one shipping invoice, dated 1456, showing 92 tons of copper in one cargo. The Dutch did much trading for copper with Japan till the year 1858.

Modern smelting methods were introduced into Japan in 1890 by the late William Gowland, and more recently Japanese engineers have adopted the latest American practices in handling low-grade ores.



The Sumitomo Besshi Copper Mine: Shisakajima Smelter

Production of copper has steadily increased during late years. In 1912 Japan became the second largest producer of the world. The copper industry in the country is next in importance to that of petroleum.

Owing to stimulation by the high prices ruling during the war, old mines were reopened. In 1917 owing to the fixing of the price of copper by the allied governments, at which Japan could not produce, her production decreased considerably. After the signing of the Armistice the price of copper seriously dropped, and it became cheaper for the Japanese to buy in the United States than to produce. During the war Japan started extensive manufactured copper and brass industries, which she will want to maintain, so she is likely to be a buyer of copper for some time to come.

Copper deposits are found in all parts of Japan, and about 40 mines were in operation till recently. The deposits of the Ashio mines (Furukawa Co.) are at Ashio in the province of Shimotsuki, and are fissure veins, the largest of which is 3,000-ft. long, 2-ft. wide, and 3,000-ft. deep, occuring in liparite intrusive through Palæozoic slate, sandstone and quartzite. The ores are chalcopyrite and pyrite in a siliceous gangue, but are complex. The Ashio mine is the largest in the Far East, has 190 miles of drives and has been worked in depth to 3,700-ft. It is operated from a remarkable 10,000 h.p. hydro-electric plant. The mine yielded 15,460 metric tons in 1919, the largest output in Japan.

In the Besshi mine (Sumitomo Co.), on the island of Shikoku, Iyo province, bedded pyritic deposits occur in crystalline schists or Palæozoic rocks, such as chloritic or graphitic schists. The ores, pyrite and chalcopyrite, contain about $3\frac{1}{2}$ per cent. copper. The largest ore-body is 5,000-ft. long, 4-ft. wide, and 3,000-ft. deep, and dips at 49°. The mine has been in the hands of the Sumitomo family since 1691. Production in 1919 was 10,610 metric tons of copper.

Complex sulphide deposits, which contain about 2 per cent. copper with blende, pyrite, galena, gold and silver, and which are replacements in Tertiary sedimentary and in volcanic rocks, are found in the Kosaka mines (Fujita Co.), in the extreme north of Hondo Island ; they were originally worked for silver. The ore-bodies are largely mined by open-cut methods. One is 1,600-ft. long, 400-ft. in maximum width, and 400-ft. deep. In 1919 the Kosaka mines produced 9,022 metric tons of copper.

Contact deposits of great irregularity as to form and size and confined to the margins between Palæozoic clay-slates and limestones, and intrusive granites and diorites, are found in the Kamaishi mines, also in the north of Hondo Island.

Ores from fissure veins and contact deposits are concentrated, the concentrate being smelted in blast furnaces with semi-pyritic smelting, the coke charge being from 8 to 16 per cent. Ores from the bedded and replacement deposits are treated usually by pyritic smelting.

Considerable amounts of gold and siver are recovered as by-products from the copper ores of Japan, most of the silver produced coming from copper ores.

The Hitachi mine S E of Ashio, in the province of Hitachi, is owned by the Kuhara Mining Co. It yielded 12,346 metric tons of copper in 1919.

The four mines, Ashio, Hitachi, Besshi and Kosaka, together, produce over one-half of Japan's output.

Production of copper and the copper trade of Japan for recent years are as follow :

Production of Copper and Copper Trade of Japan.
(Long tons)

	London price (electro). £	s.	d.	Production [3]	Imports.	Exports.	Consumption.	Stocks
1914 ..	62	5	6	78,700	nil	43,305	32,045	1,500
1915 ..	84	2	7	83,017	324	56,528	27,723	4,873
1916 ..	138	0	10	111,562	2,325	58,432	59,690	536
1917 ..	136	8	10	122,379	14,109	71,052	63,309	2,227
1918 ..	128	5	10	95,455	1,068	31,553	65,397	2,250
1919 ..	100	15	1	81,855	27,570[2]	19,132	67,188	26,800
1920[1] ..	110	12	10	65,000	22,600[2]	5,000	83,000	25,000

1 Estimated.
2 Sudden increase due to home development of water-power undertakings and to increased demand from China for copper for coinage.

The increase of consumption in 1916-18 was owing to the war ; the increase in 1919-20, to the consumption of copper wire for transmission purposes by new hydro-electric power schemes.

Recent costs of producing copper in Japan, calculated at 1 yen=$24\frac{9}{16}$ pence, are as follow :

Costs of Producing Copper in Japan
(Per long ton)

	£	s.	d.		£	s.	d.
1914	48	10	0	1918	78	0	0
1915	43	6	0	1919	88	8	0
1916	53	15	0	1920	107	10	0
1917	62	8	0				

The distribution of Japanese exports of copper for recent years is as follows :

Exports of Copper from Japan

(Long tons)

Destination.	1914.	1915.	1916.	1917.	1918.	1919.	1920.[1]
China ..	14,083	1,432	1,490	4,929	7,420	13,692	3,500
British India ..	2,444	1,221	86	3,991	2,437	1,375	350
Asiatic Russia ..	5,061	29,536	35,244	10,767	139	—	—
Great Britain ..	6,813	12,251	14,352	24,587	5,417	452	600
France	3,487	3,958	4,175	17,977	8,510	141	100
Italy	200	—	—	4,225	4,374	1,859	—
United States ..	4,701	7,833	2,920	2,617	37	—	—
Other countries ..	6,516	297	164	1,957	3,219	1,613	450
	43,305	56,528	58,432	71,052	31,553	19,132	5,000[2]

1 Estimated.

2 Not including copper re-exported from bonded warehouses, estimated at 12,000 tons.

Formosa.—Copper ore is mined in the north of Formosa (Taiwan) principally in the Kinkaseki mine, and also in the Dobunran mine in Karenko province, and in the Futa mine in Giran province. The two latter mines were opened recently.

Recent productions of copper in Formosa are as follow :

	1914.	1915.	1916.	1917.	1918.	1919.
Metric tons ..	1,875	1,482	1,151	1,008	610	877

Korea (Chosen)

Copper is found in abundance in different parts of Korea but development of the deposits has been delayed largely owing to absence of transport facilities.

The Suan concession, granted in 1905, is in Hwang Hai province, Central Korea ; in 1908 it was taken over by the Seoul Mining Co. of Denver, Colorado.

The ore deposits of the concession are of the contact-metamorphic type, occurring in limestone around the edges of a granitic batholith, elliptical in shape and roughly six miles by five miles in its main dimensions. The periphery, known as the Collbran contact, is about 23 miles in circumference. The intrusion of the granite has uplifted and shattered the surrounding sedimentary rocks, producing intense contact metamorphism. Around the edges of the contact ore-bodies occur irregularly in the gangue, which is a highly siliceous crystalline limestone, altered by contact action, containing a considerable amount of magnesia and alumina. The ore is invariably associated with faults that have served as passages for hot mineralizing solutions. The valuable metals of the ore, which consists mainly of chalcopyrite with some bornite and tetrahedrite (rare), are mainly gold and copper ; bismuth (as bismuthinite) silver and tungsten (as scheelite) also occur in economic quantities ; galena, blende and molybdenite, only in small amounts.

As a general rule the gold-copper ores occur close to the contact, whilst those of lead and zinc are farther from it. D. F. Higgins states that there is very little secondary concentration at the Suan mine, and J. M. Maclaren, who examined the property in 1915, came to the conclusion that the ore-bodies represent primary sulphide deposits, the upper portions of which have been eroded away. The Suan mine, 650-ft. in depth, is almost worked out.

The Tul Mi Chung is now the principal mine of the Seoul Co. The majority of the ore-bodies are either formed close to a tongue of quartz-diorite, which divides the mine into two portions, or at the flatly-dipping boundary of limestone with overlying schist. The ore-bodies, on the whole, lie near the walls of quartz-diorite and, in all probability the ore was deposited in the limestone by metalliferous solutions that followed in the track of the intrusion (Maclaren). The Soctaric ore-bodies near-by consist of a flatly-dipping band of siliceous limestone, in places altered to a quartzite. The average thickness of this band is about 30-ft. It could be quarried and operated in 1916 at a profit, when the reserves were estimated at 2,300,000 tons containing ½ dwt. gold per ton, 0.95 per cent. copper and 0.25 per cent. tungstic acid.

In the Suan mill (capacity 8,000 tons per month), after the introduction of flotation in 1913, the gold and copper extraction amounted to about 90 per cent., and that of the bismuth to 60 per cent. The average grade of the mill-ore to the end of 1918 was gold, dwt., silver, 0.6 oz. per ton ; copper, 0.92 per cent. and bismuth 0.08 per cent. The ore treated at the Tul Mi Chung mill (capacity 14,000 tons per month) to end of 1918 averaged gold, 6 dwt.; silver, 0.5 oz. per ton ; and copper, 0.98 per cent. The flotation concentrate; contains gold, 25 dwt., silver, 9 oz. per ton, and copper, 26 per cent. The copper extraction during 1918 averaged 90.34 per cent., and the gold extraction about 60 per cent.

In 1916 the reserves, not including those of the Soctarie deposits, were estimated at 1,221,000 tons valued at $13,460,000.

There has recently been great development at the Kapsan copper mines, which were bought in 1916 by a Japanese company from its English owners for £300,000. During 1917, 2,000 tons of roughly refined copper were sent to Japan. The mine is in the South Kankyo province and is equipped with a smelter of 200 tons per day capacity. The Kosho mine is in the Huchang district, in the extreme north of Korea, within a short distance of the Yalu River. Important copper deposits have been discovered in the South Chusa province in Southern Korea, and a refinery is being erected.

Tsingtau has become the centre of a big Japanese export trade since 1915. The exports of ore in 1916 were 34,000 tons.

New Caledonia

Deposits of copper ore, some auriferous, are in New Caledonia principally in the north, in the Diabot Valley and Pam districts. The principal mine is the Pilou, but formerly the Edison mine at Pouembout was the most important. Copper is also mined in association with nickel. Outputs of copper in the colony in metric tons for the period 1908-1912 according to the *Statistiquss de l'Industrie Minère dans les Colonies Françaises* (annual) were :

	1908.	1909.	1910.	1911.	1912.
From copper ore ..	108	1,337	1,126	266	—
From nickel ore ..	7,501	[1]	9,630	[1]	11,116

1 Not reported

Philippine Islands

A number of copper deposits are to be found on the islands Luzon, Malolos, Mindanao, Marinduque, Mindoro, Panay, Masbate of the Philippines, but all are awaiting development with the exception of the Mancayan deposit in Northern Luzon. Prospecting on the islands has practically ceased. In the island of Luzon are to be found veins of enargite and *famatinite*[1] (Cu_3SbS_4) with selenium compounds of silver and copper in association with the usual secondary minerals. Obstacles to mining and smelting copper ore on the islands are numerous and great. There has been no production of copper since the American occupation.

Timor (Portuguese)

Chalcopyrite is found at Mt. Birogue, west of Baucau in Portuguese Timor. Other copper deposits occur, but all are unexploited for want of capital.

China Electric Company

Seven new telephone exchanges have recently been completed at Nanking, Shanghai, Soochow, Wusih and Peking. A toll line is now under consideration between Shanghai, Nanking, Hankow, Tientsin and Peking. This expansion of China's telephone system has made necessary a factory at Shanghai for the manufacture of the apparatus. The China Electric Company was organized by the International Western Electric Company and the Chinese ministry of communications in 1917. In 1919 work was started in the new plant at Shanghai, which now employs 450 Chinese workers.

Here are manufactured telegraph instruments, telephone sets, special telephones and switchboards for military purposes and central office switchboards and other apparatus. While this work is of a technical nature, the Chinese are very adaptable to such work, being not only deft, but extremely patient and easily contented. Such a thing as a labor problem is rare in China.

The largest contract completed by this Chinese factory was the Hatamen street exchange in Peking. It is a 3,000 line equipment of the central battery type, and has a capacity of 10,000 lines. It employs 38 operators. The China Electrical Company is also setting up small lighting plants for use in foreign compounds in the interior, schools and similar places. These plants are run by engines which are started by gasoline and operated by kerosene.

Java's Volatile Oil Industry

By K. R. F. Blokzeyl

THE oil derived from citronella grass (Andropogon Nardus) is certainly one of the best known "Aromatic Grass Oils," which designation may be conveniently used to group together the several essential oils obtained from members of the genera Andropogon, Cymbogon and Vetiveria, belonging to the grass order (N. O. Graminaceae). The group includes a number of volatile oils of very considerable commercial importance, which, although finding much use in a medicinal way, have their greatest value to the perfumer and manufacturer of scented soaps, not only on account of their natural perfume, but because they contain large percentages of prime materials used in the preparation of certain types of synthetic perfumes, such as "otto of rose," etc.

The distillation of citronella oil in Java is an industry which has assumed large proportions during the last decade, its rapid growth in recent years being due in part to the opening up of remunerative lines of work by pioneering scientific workers, and in part to the greater demand for this product by manufacturers in the United Kingdom, the United States, Japan, France, and other countries.

According to the customhouse statistics, the exports of the oil from Java rose from 75,200 kilos in the year 1913, to a record of 528,500 kilos in 1910, whilst during the last two years, 273,200 and 434,700 kilos, respectively, have been shipped from the island.

Throughout Java, but more especially in the western districts, there are scattered a number of large distilleries under European management, and dozens of smaller, which for the greater part are situated at the bases of hilly ridges, where cold water for condensation purposes is to be had plentifully.

The cultivation of the grass is very simple. Clumps of well-grown uncut plants are divided into "slips" or "shoots" and planted 2 to 3 feet apart. The planting is done in wet weather, and most of the slips throw out roots and set.

The gardens are, as a rule, laid out on open hillslopes, as the plants like full sun-heat, although they thrive fairly well under large trees, f.i. rubber trees, where they are sometimes cultivated as a secondary crop, but under such conditions a smaller quantity of leaves is obtained.

A long and pronounced drought is unfavorable to their development, the best results being obtained in districts where a damp climate and regular rainfall throughout the year are prevailing.

Under normal conditions the grass grown rapidly and form "stools," about three feet in height and twelve inches in diameter in from six to seven months. It can be cut from five to six months after planting, and three times in each succeeding year. The stools require replanting at intervals of about four years if the industry is to be a profitable one.

Formation of seeds is prevented by regular harvests, as otherwise the tufts of grass become too dense and spoil. Weeding is rarely necessary after the planting period. On some estates the ground is forked after the grass has been cut.

When the grass is used for fuel, after the extraction of the oil, the ashes are sometimes scattered over the ground for manure. This manuring process, however, is usually left off since it has been found that the plants, though growing up luxuriously and producing a larger amount of leaves, are decreasing in their oil content.

Recently published returns show a number of estates producing volatile grass oils in Java amounting to 35, with a total planted area of more than 15,000 acres, an acre yielding, on an average, from 50 to 60-lbs. of oil in a year.

The grass is always distilled in the fresh state, i.e., as soon as it has been carted in from the gardens. Sometimes the larger bundles are cut into smaller pieces before being steamed.

The distillation is carried on by direct steam only, no water being first added to the grass in the still. The principles of this method depend upon the property of the steam as it passes through the charged apparatus to carry with it the volatile portion of the plant in the form of vapors, which are condensed, together with the excess of watery vapor, and deposited in the receiving vessel. Thus the three steps in the process are (1) the distilling, (2) the condensing of the vapors, and (3) the collecting of the oil.



Weighing Bundles of Citronella Grass on Arrival at the Distillery.

The distilling plant consists of a more or less modern steam boiler provided with safety valve and water gauge, resting on a concrete foundation. The steam is passed into one or more separate stills, which, in the larger distilleries, are erected in batteries. A still is a cylindrical vessel made of cast-iron and resting on a solid brickwork. It is, as a rule, about 3-ft. to 4-ft. in diameter, and 6-ft. to 7-ft. high, closed at the top with a flat lid fastened down with thumb screws. Near the top of the still is a pipe communicating with the condenser, which consists of an iron tank through which cold water is kept running. The condensing worm passes through this tank and issues from the side where it is received by a Florentine flask (mostly made of metal) to collect the distillate.

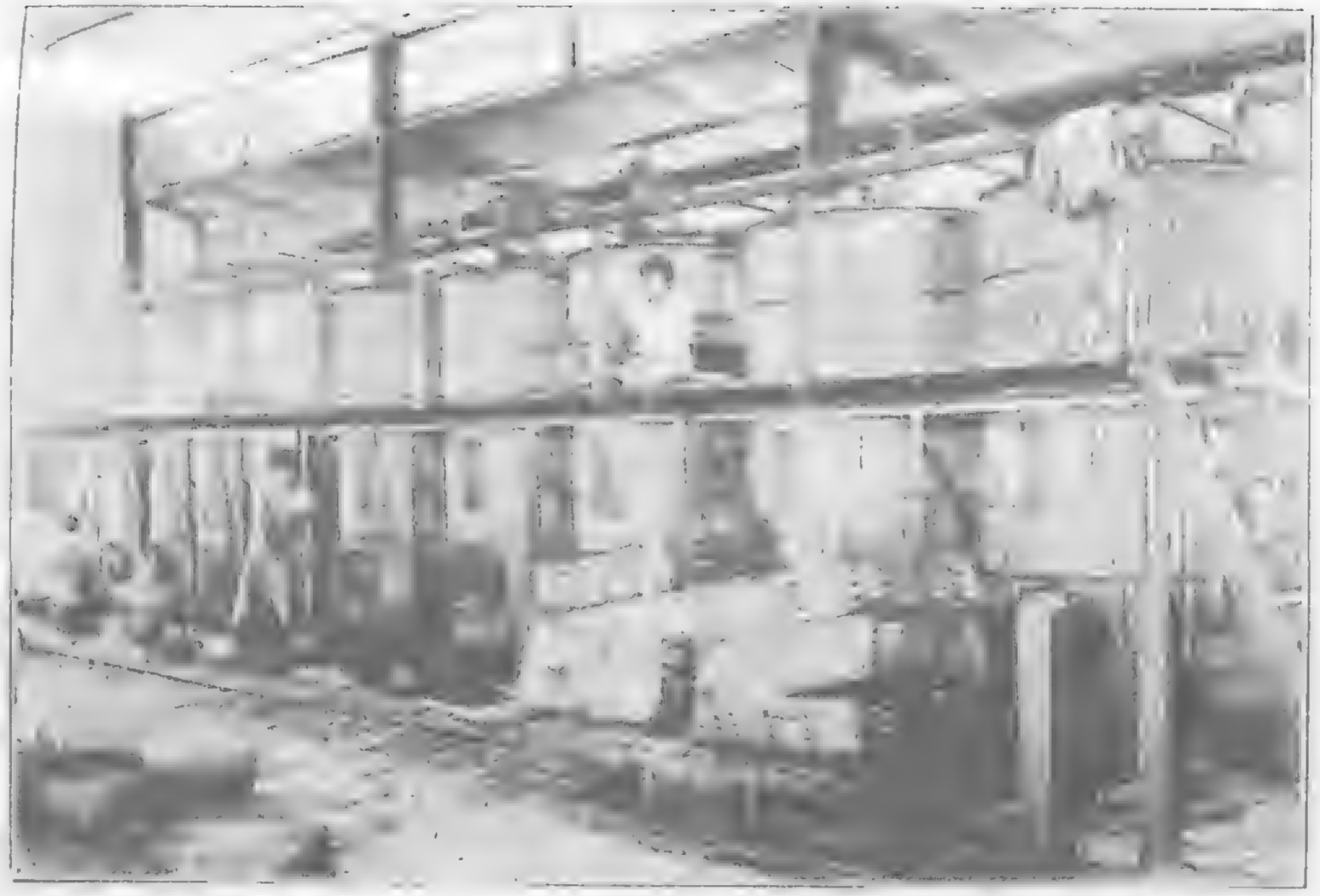
Economy in the process is practised even to the extent of using the water of the condensing vessel when it gets hot to feed the boiler with, so as to economize in fuel.

The space of time, necessary for the distillation process is not the same at all distilleries, as this depends on may factors. Usually, however, a distillation is completed in from one and one-half to two and one-half hours.

The yield of oil is much influenced by such factors as soil, dryness, moisture, altitude, sunshine, age of the harvested leaves, and distilling efficiency. As a result of this, it varies in Java from 0.6 to 1.1 per cent. of the fresh material.

To separate the oil from the aqueous distillate in the receiving vessel, the portion which has not been separated by means of the stop cock on the side of the receiver is poured into a separating

VOLATILE OIL DISTILLERIES IN JAVA



Battery of 9 stills in a Java Citronella Oil Distillery. The iron stills are covered with split bamboo rods for steam economy



View in a Java Citronella Oil Distillery, showing battery of four stills and locomobile boiler producing steam for distillation



Marine boiler installed in the oldest Citronella Oil Distillery in Java; in use since 1909



Simple type of stills (containing material suspended in water and applying direct heat) used by Chinese distillers of Cananga oil in Java

funnel of glass and the heavier liquid drawn off. The oils resulting from different stills are then united and subjected to filtration, which process tends to separate any solid particles or emulsion of oil and water. Filtration is effected by pouring the oil into a glass funnel which has been fitted with a filtering medium, such as filter paper or cotton. A clear and transparant oil finally results, bearing in every way the appearance of a marketable oil and having a specific gravity of 0.885 to 0.901 at a temperature of 15° C.

The market value of citronella oil depends chiefly on the percentage of geraniol present. This percentage, as far as the Java oil is concerned, varies between 80 and 90 per cent., whereas for the Ceylon oil it is much lower, viz.: 60 to 65 per cent. only, and it is, therefore, no wonder that Java citronella oil fetches prices on the world market which are very considerably higher than those paid for the Ceylon product. It is true that Java oil is distilled from a species of grass which yields a distinctly superior oil to that obtained from the Ceylon Anderpogon grass, but quite apart from this natural difference in quality, there is the fact that the Java product is always pure, while the Ceylon oil—with the exception only of small quantities, usually designed "Estate oil," which is really pure oil too—is almost invariably adulterated by the Singhalese in whose hands the industry is, owing to these producers being unable to resist the change of gaining an illicit profit.

The importance of the citronella oil industry in Java may be gathered from the following table, giving the quantities of exports of this article from the island, together with the principal countries of destination, during the last ten years:—

Year	Gr. Britain Kilos	U.S.A. Kilos	France Kilos	Holland Kilos	Germany Kilos	Japan Kilos	Totals, incl. other destinat.
1913 ..	—	6,637	21,137	20,422	23,824	—	75,230
1914 ..	1,500	25,787	31,446	55,666	17,164	5,091	136,654
1915 ..	60,394	63,560	38,049	55,713	—	12,377	233,326
1916 ..	151,719	196,065	40,653	14,278	—	19,416	428,743
1917 ..	213,631	204,807	15,654	5,565	—	50,437	515,763
1918 ..	—	84,478	—	—	—	80,867	228,124
1919 ..	91,264	85,619	69,360	233,095	—	6,912	528,534
1920 ..	75,230	46,921	80,767	124,496	—	18,590	434,445
1921 ..	13,052	100,931	28,332	34,278	5,020	67,487	273,140
1922 ..	137,944	97,960	47,694	64,095	21,070	47,852	434,708

With regard to the export to Germany, it should be borne in mind that a considerable portion of the quantities mentioned under Holland before and post-war, subsequently found its way to Germany. For this reason the above figures do not give a correct representation of the German demand.

Java citronella oil is packed for export in galvanized iron drums containing about 300 litres and weighing a quarter of a ton or 560-lbs.

Having dealt with citronella oil, we will now turn to another volatile grass oil, distilled in Java, viz.:

Lemongrass oil, which is derived from the leaves of a grass, bearing the botanical name of Andropogon Citratus. The most interesting feature of the oil is the large percentage of citral that it contains. This has been variously stated at 70 to 80 per cent. and in inferior or adulterated samples at 40 to 50 per cent.

The oil is employed in the manufacture of artificial perfumes, such as the violet known as ionone, and, like all the aromatic grass oils, is utilized mainly in perfuming soaps.

Cultivation of the grass and distillation of the oil are done in the same way as for citronella, but the grass is smaller and yields a much less amount. The price of the oil, however, is higher.

As a result of experiments, it has been found that 496-lbs. of fresh grass yielded 1-lb. of crude oil (0.2 per cent.), the estimated yield per acre, per year, being about 20 to 25-lbs. of crude oil. The yield of refined oil, however, is much less than this.

As long as British India—where lemongrass is mainly grown—supplied only moderate quantities of the oil to the world market, resulting in prices reaching an exceptional high level, Java could easily compete with the product of other origin. However, as soon as shipments from India increased, and also other colonies like Indo-China and Reunion started the production on a commercial scale, prices of the Java oil, which contains a lower percentage of citral, dropped to such a level that the industry was no longer remunerative, and since then nearly all distilleries in the island were compelled to close down.

In recent years, Java lemongrass oil can only be produced profitably and in fairly important quantities by the government rubber estates, where the grass is grown between the rubber trees as a secondary crop.

Export figures are not available, as the oil is not separately mentioned in the customhouse statistics.

Vetivert oil is a grass oil distilled from the roots of Vetiveria zizanioides. This plant is indigenous to India and Ceylon, and introduced into Java, Reunion, the Seychelles, and elsewhere.

The dried roots of the grass, which yield from 0.4 to 0.9 per cent. of volatile oil, are exported from Java in considerable quantities to Europe, where the material is distilled for essential oil, used for "heavy" types of odors, and which has a very great fixative value as well. The powdered roots are also in use as a sachet powder.

On a small scale, vetivert oil has also been distilled in Java for export, and by doing so freight was saved and loss of essential oil avoided, but since its preparation has been found a matter of some difficulty, producers of the roots prefer to ship this material only cleaned and dried.

There has been considerable over-production of vetivert roots and oil in Reunion in the past, but it is stated that production has been much reduced lately, owing to the unremunerative character of the industry.

The result of investigations by experts have shown that the oil derived from Java vetivert roots, when distilled by European methods, is of excellent quality and quite equal to the best oil distilled in Europe from Indian and other vetivert roots.

Cananga Oil.—This perfume oil is chiefly prepared by natives and Chinese in the district of Bantam in West Java, from the fresh flowers of a tree, the Cananga odorata, and which bears flowers twice a year.

The flowers are collected by climbing the tree, and picking is done by means of bamboo poles. Before distilling the material is slightly bruised.

Distillation is done according to the old-fashioned method by means of water and in most primitive copper stills, which are heated by an open fire. This has the great disadvantage in the fact that the heat, being applied directly, has a tendency to char or burn the material adjacent to the bottom of the still, and thus appreciably affect the quality of the aromatic product distilled over.

Besides in the Bantam district, where the cananga tree is cultivated for the industry on a small scale, some oil is also made in the district of Cheribon, Java, from wild growing trees, but the Bantam oil is considered better, the smell being intenser and the product contains less esters and free alcohols.

In odor and general properties the Java cananga oil is inferior to the well-known ylang-ylang oil prepared in the Philippines and in Reunion, which product is considered standard by buyers. But, with a more general introduction of improved methods of collecting the flowers and the installation of modern apparatus for the extraction of the oil, a large increase in foreign sales might be expected.

The yield of oil is at present only 0.1 per cent., and the specific gravity of the oil 0.93 to 0.94. The total production in Java is only small, and the article is, therefore, from a commercial point of view, not of much interest.

Other essential oils, such as Chenopodium, Champaca, Palmarosa, etc., are prepared in Java on a very limited scale only, and are not always obtainable for export.

Installation of the First Telephone Toll Cables in Japan

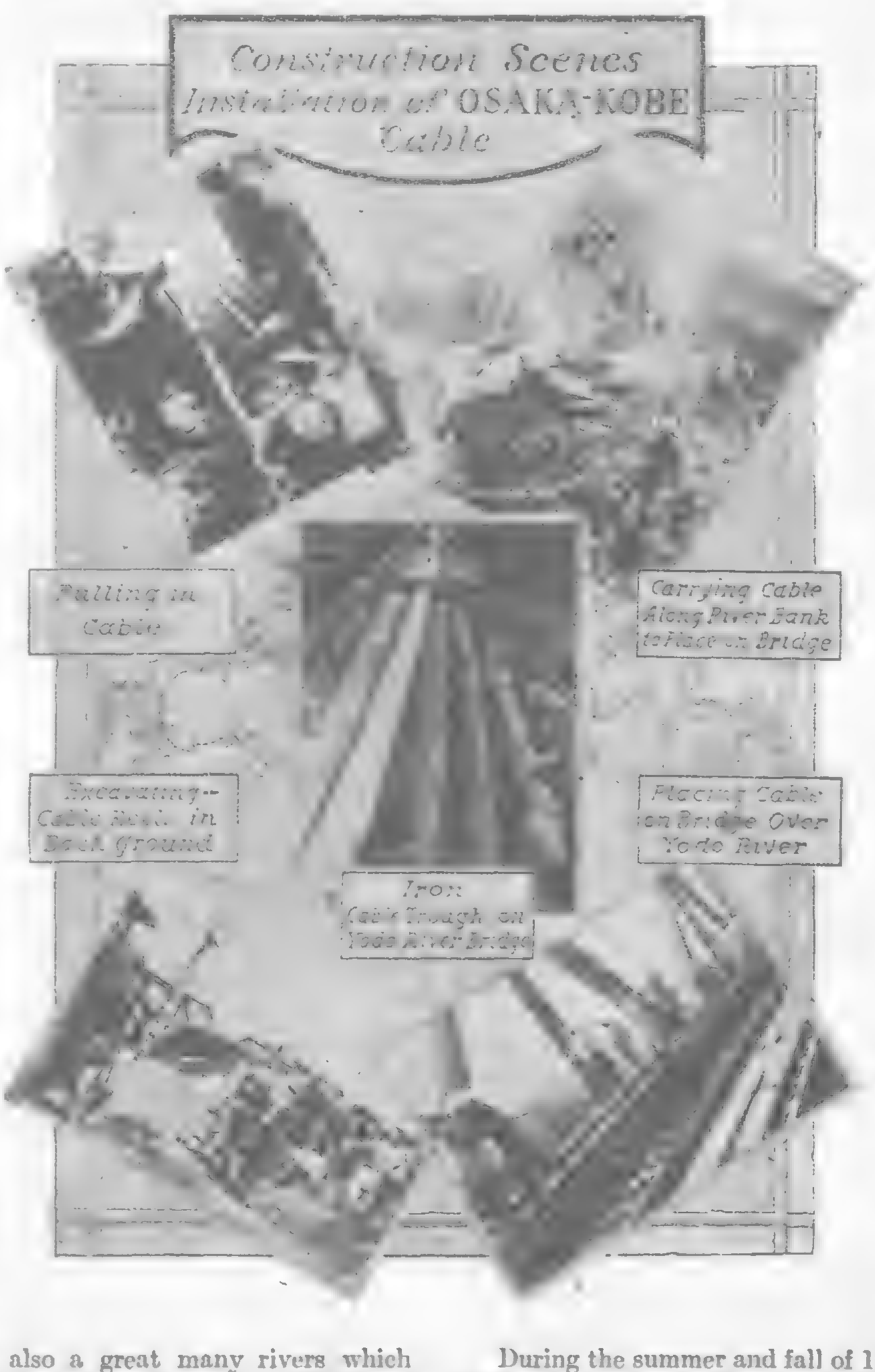
By R. P. Ashbaugh, Engineering Department, Western Electric Company

OWING to the mountainous nature of the central portion of the main island of Japan, the population of the country has concentrated on the coasts. The development of the Pacific coast cities, lying as they do at the gateway to the Orient, has been most rapid by reason of their location. Telephone toll service, inaugurated between Tokyo and Yokohama in 1890, has been steadily extended; Tokyo and Osaka, distant 350 miles, being connected in 1897, and telephone circuits at present extend from Sapporo, on the island of Hokkaido, to Nagasaki, on the island of Kiushiu, a distance of about 1,500 miles. All of this service has until recently been supplied over open wire lines.

The demand for power in the industrial centres led to an early consideration of methods for utilizing the very extensive water power of the country and the growth in hydro-electric installations has been rapid, involving a considerable extension of the high-tension electric power distribution networks. As the topography of the country limits the number of possible routes which may be utilized for pole line construction, these routes must be shared by both signal and power circuits. The signal circuits are subjected to the possibility of inductive interference and hazard from crosses inasmuch as the width of the roads and streets, particularly in the villages, prohibits adequate separation.

The natural conditions in the country have made it particularly difficult to maintain the open wire lines in a satisfactory condition and to insure continuity of service. Japan is situated in the typhoon area. During the summer months it is often visited by devastating storms which do great damage and in many cases have destroyed large sections of telephone lines. There are also a great many rivers which are subject to floods during the stormy seasons. These add to the difficulty of making satisfactory crossings, the river beds being unstable and from time to time shift. They are often half a mile or more in width. Further inland, the rugged mountainous country which is often volcanic, presents other difficulties on account of steep grades and the frequent occurrence of land slides due to the rather rapid erosion of the mountains. In some cases it is not possible to avoid proximity to hot springs which give off sulphurous fumes adding greatly to the corrosion of the open wire lines. The humidity throughout Japan, particularly along the coast, is very high and makes it difficult to maintain a satisfactory insulation.

In order to overcome these difficulties and relieve the serious congestion in toll traffic which existed between Osaka and Kobe, and also between Tokyo and Yokohama, the Japanese government placed orders with the Nippon Electric Company, Limited, an Affiliated Company of the International Western Electric Company, for loaded duplex toll cables, to be installed between these cities. Both cables are of the same size and type and of approximately the same length, 22 miles. Each cable consists of 52 quads (4 quads of No. 13 A.W.G. conductors, 14 quads of No. 16 A.W.G. conductors and 34 quads of No. 19 A. W. G. conductors). The cables are loaded throughout with medium heavy loading on 6,000-ft. spacing, the inductance of the side circuit coils being approximately 0.175 henry and of the phantom circuit coils 0.107 henry. The equivalents of these circuits in miles of standard cable (one mile equals an attenuation of 0.109 at 800 cycles per second) range from approximately two miles to about 6½ miles, depending on the gauge of the circuit.



Both the cables and loading coils were manufactured at the Hawthorne Works of the Western Electric Company at Chicago and shipped the latter part of 1921. The installation of the Osaka-Kobe section was completed in the fall of 1922, and installation is in progress on the Tokyo-Yokohama section. The Osaka-Kobe section is almost entirely underground, the only exception being a small amount of aerial construction at two river crossings and another where the cable crosses a river on a railroad bridge.

The underground conduit is about one-half concrete block and one-half iron pipe. Manholes in Kobe and Osaka and in the larger villages and at all loading points between are similar to the types standard in America. In the remainder of the line where concrete block conduit is used, the manholes comprise small rectangular concrete boxes placed just beneath the roadway. Where the iron pipe conduit is used no manholes are provided, but after the joint in the cable is made, a larger section of iron pipe is slipped over it and then the earth filled in over the joint. Throughout all this part of the line the roadway is dirt with some admixture of sand and gravel, so that it is not difficult to dig down to the splice whenever necessary. Some interesting features of the construction work are shown in the group photographs.

During the summer and fall of 1922, the Japanese government telephone engineers, co-operating with engineers of the International Western Electric Company and its Affiliated Companies, the Nippon Electric Company of Tokyo and the Sumitomo Electric Wire and Cable Works, Ltd., of Osaka, undertook a survey for a toll telephone cable project to reach from Tokyo to Odawara, a distance of about 60 miles.

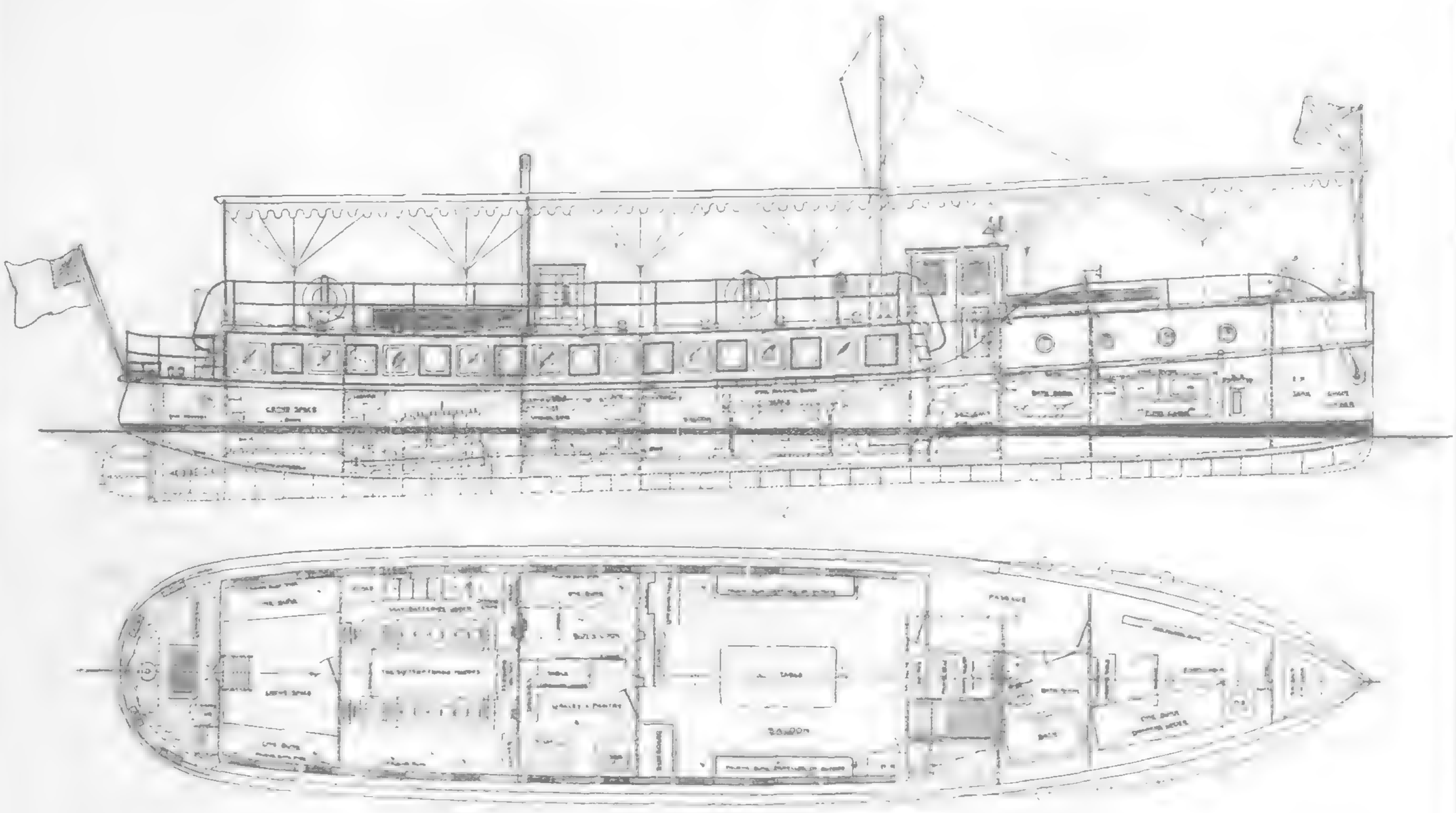
The cable will include both aerial and underground construction depending on the conditions encountered in the various localities through which it passes. Where routes through open country are possible, aerial construction will be used. Through the usually narrow and congested streets of the more populous villages and through the cities, the cable will be laid underground. This is an important measure toward avoiding possible interruptions to the service as a result of fires in the villages and towns.

(Continued on page 479)

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Roads, Bridges and Transportation in the Antung District

By J. Murrihy

THE climatic conditions prevalent in Manchuria in winter turn rivers into roads, the waters of the Yalu and its tributaries are frozen into ice strong enough to support the heaviest traffic, and usually from the end of November to the beginning of March, vehicles of many kinds may be seen hauling farm produce and passenger traffic over the ice. The hauling animals are generally shod with frost nails which enable them to get a sure foothold.

The public roads of this locality are abominable, except those in the Japanese town. Sledges are in common use both for passengers and goods; a large amount of timber logs and other produce are pushed down on sledges in winter, by what is locally known as "Rice Power," i.e., coolies who wear shoes with spikes to enable them to get footholds in the ice. Along the banks of the Yalu the country is intersected with rivers, cross-canals and creeks, which when frozen, are good roads, but cart-traffic in this locality is impossible in summer, and without the aid of birdges, traffic is retarded in warm weather.



The Fine Roads of the Japanese Settlement of Antung

Manchuria is ice-bound for at least four months of the year, and during that period water-borne traffic ceases, the ground is frozen hard, and where it is level, roads are not necessary at all; traffic may be hauled over paddy ground, if the load is too heavy, extra animals may be hitched on with ropes, and off they go over the plains anywhere.

This cart-trade from the interior of Manchuria is immense, large quantities of cocoons, and farm produce are hauled down, and it might be supposed that some care would be taken to keep the roads over which it has been transported in order. The absence of bridges causes animals to partly swim and wade over streams with their burdens. The roads are often worn below the surface of the surrounding land and during the rainy season become rivers. Instances of animals being drowned on the roads are not unknown.

These roads with their deep ruts are permitted to freeze hard without any repair, heavily-laden carts are hauled along by tired animals which are whipped at frequent intervals.

Heavy cargo-carts, made to suit these bad roads of Manchuria, are made of stout Korean elm capable of withstanding the bumping and jolting to which they are constantly subjected. The heavy iron-studded wheels revolve with the axle, these wheels have only three spokes, one strong beam and two smaller ones at right angles which are spliced together with large iron rivets and the fellies encircled with heavy iron tires.

These carts will carry a couple of tons or more over the worst roads for years, or until they break down, which usually happens in some narrow pass where only one cart can enter, then the whole traffic is stopped for hours and there is general pandemonium, whipping and shouting which can be heard far off.



Chinese City of Antung: The "Vegetable Market" Street, like a River in Rainy Weather



Animal Drowned in the Streets of the Chinese City of Antung

CONTRASTS IN GOOD GOVERNMENT



A German Road Roller at Work



Road Making in the Chinese City of Antung

Portable Track and Tipping Wagons

The passenger cart is lighter than the above and resembles a miniature box-car or a large saratoga trunk, covered with blue cotton cloth and sometimes lined inside with goat skins, there is room inside for two passengers, or three small people. The entrance to the cart is in front, covered with a heavy cloth door with a pane of glass in the middle ; there are no springs and the bumping and jolting over hard uneven bean-fields can better be imagined than described.

When the natives of Manchuria travel in winter they go in pairs, if possible, and usually lie close together for the sake of warmth, the heat of one body keeps the other warm and *vice versâ* ; moustaches are not at all necessary in these journeys, as the process of thawing lumps of ice which cling to them is very painful. Those intending to travel in Manchuria during winter ought to cut off their moustaches, otherwise they will be compelled to carry extra weight in the shape of icicles suspended from their upper lips.

In damp roads, the frost penetrates three or four feet deep, this is warmed by the rays of the sun in May, and forced to doze out by the heat, and the roads which were in good condition in March are sometimes like india rubber in June. When the roads begin to soften in the spring, the carters unload part of their cargo before they arrive at Antung, the great trade mart of Southern Manchuria, where the goods are stored until the ice breaks up and the Yalu opens to navigation.

The roads of this locality are not straight but meander through bean-fields and streams; on high ground they are pounded hard by years of traffic.

The above gives a fair idea of the roads and the means of transport for conveying passengers and traffic from the interior of Manchuria to Antung.

Within the limits of Antung some of the roads in the Japanese settlement are as good as can be found anywhere. Three Ruston Proctor steam-rollers are constantly at work in the Japanese settlement. The only drawback is that these good roads are not long enough, as, after a few miles ride one comes to the end, and must turn back. Although the roads of the Japanese settlement have a level surface, the place has not yet been supplied with side-walks for foot passengers.

The roads of the Chinese town are the opposite of those described above and these may be classified as bas as can be found anywhere. During the rainy season of 1922, the roads of the Chinese town were like streams or a succession of ponds, through which the weary animals could only struggle forward at a snail's pace, with the wheels of the carriages submerged beyond the hubs. Ricshaws cannot negotiate the puddle at all. It is said that at one time the streets of Peking were also in bad shape, and a foreign official who got stuck in the mud of legation street said "If all expenses for me were paid I to Peking no more will go." He ought to have been sent to Antung.

Antung being built on the delta of the Yalu, when the river overflows, there will always be trouble with the roads, as the excess water will interfere with the sewage on such a dead level unfavorable for drainage. The Chinese are, at last, trying to emulate the Japanese in road making. A Danish consulting engineer named Mr. Gernow, employed at a salary of $500 per month by the Chinese chamber of commerce, is engaged in road making in the Chinese town, and since his arrival some improvements have been made. Mr. Gernow is insisting on proper drainage and has had some difficulty to make the native officials accede to his views until he refused to continue work until the subsoil was properly drained.

Sewage pipes have now been laid on some of the large streets. When the ditches were first dug, the Chinese used them as receptacles for refuse, and orders had to be issued to prevent them from dumping their rubbish into the pipes. Wooden boxes are now provided for refuse which is removed occasionally under the supervision of the police.

A steam-roller imported from Germany is now at work in the native town, the cost of it is said to be $12,000.

We shall now say a few words about the bridges of Antung, for without the bridges, the roads would not be very important.

Antung, situated on the right bank of the Yalu river about thirty miles from its mouth, chiefly owes its prosperity to the Yalu Bridge ; over which Japan is enabled to get her raw materials from Manchuria and import her commercial commodities. Built in 1910 at a cost of 3,000,000 yen ; the bridge is 3,096-ft. long, with twelve steel spans, six large ones on the Manchurian side, and six small ones on the Korean side, supported by solid stone piers. The material was supplied by the United States Steel Products Company and its construction supervised by the late Mr. H. Okamura and Mr. Whitmore.

There is a swing span in the centre to permit boats with tall masts to pass. The bridge is opened four times daily during the following hours : from 4.30 a.m. to 5.30 a.m., 8.30 a.m. to 9.30 a.m., 0.30 p.m. to 1.30 p.m., and from 4.30 p.m. to 5.30 p.m.

Chin-An Bridge, known by the Chinese as the Chin-An-Ch'iao, is the next largest bridge in Antung, situated at the northern end of the Chinese city spanning the Ta-Sha-Ho (big sandy river) a tributary of the Yalu). It is called after the old name of Antung which was Chin-Kou and was afterwards known as Sha-Ho-Tze (Sandy river). When the port was opened by commercial treaty with the United States in 1903 this place was called An-Tung-Hsien (Eastern Peace District).

The Chin-An-Ch'iao, built in 1920, is of reinforced concrete and stone it, costing $22,000. It was built under the supervision of the Chinese chamber of commerce, and connects Antung city with the district known as Pei-Kan-tze (the northern slope). Until this bridge was built the traffic over the Sandy River was almost impossible in summer, because the water was too shallow for boats, and the bottom of the river not solid enough for vehicles.

Boundary Bridge

This bridge, now under construction, spans the creek of Ch'i-Tao-Kou (7th creek) which separates the Chinese city of Antung from the Japanese settlement. It was originally agreed that half the cost would be paid by the Chinese ; but they were slow, as usual, in coming forward with the money, and the original plan was abandoned. After years of fruitless negotiation between the South Manchurian Railway Company and the Chinese authorities and repeated repairs to the old wooden bridge, which at last became dangerous, the South Manchurian Railway Company and the customs agreed to put up a new bridge according to the following

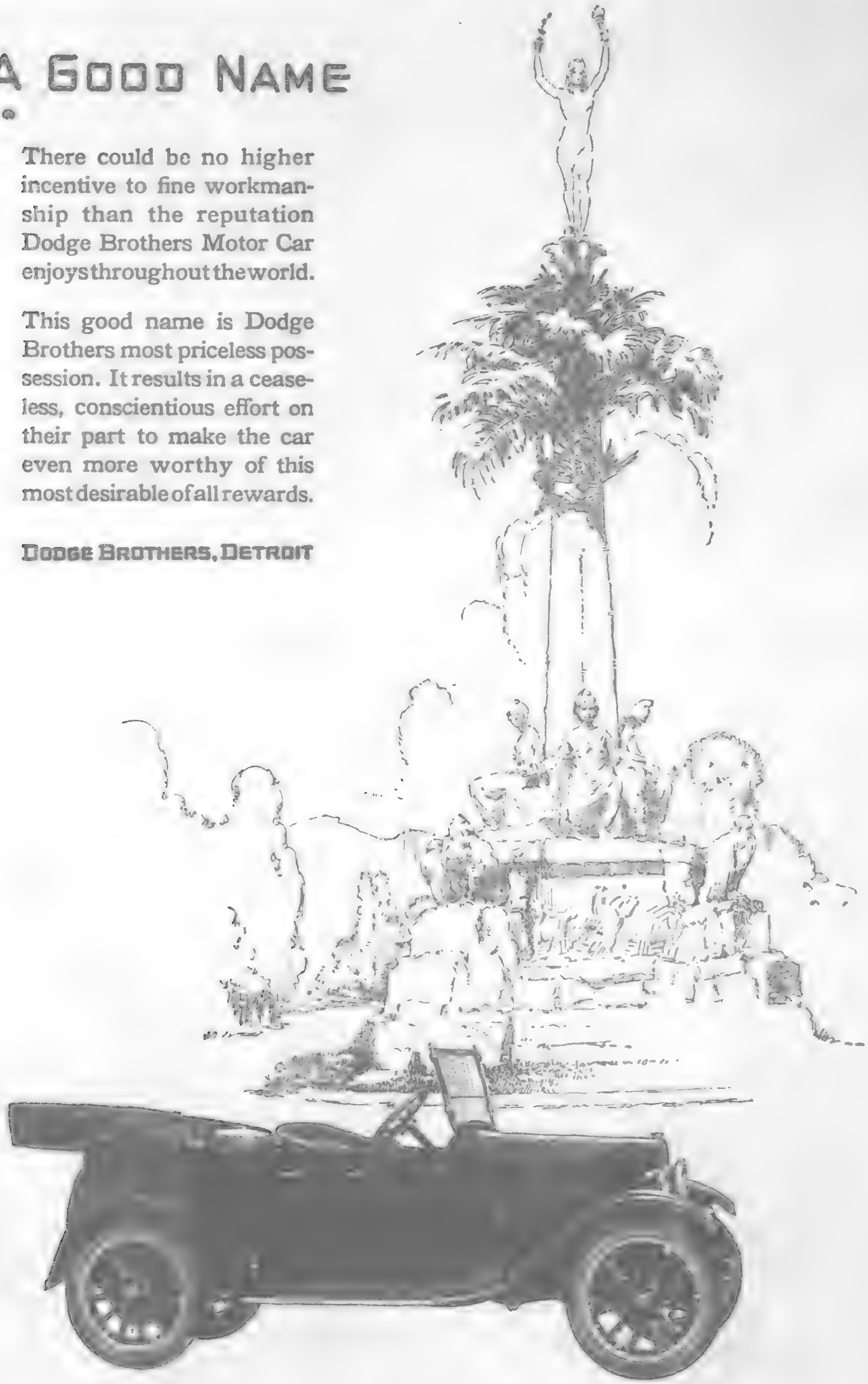
(Continued on page 496)

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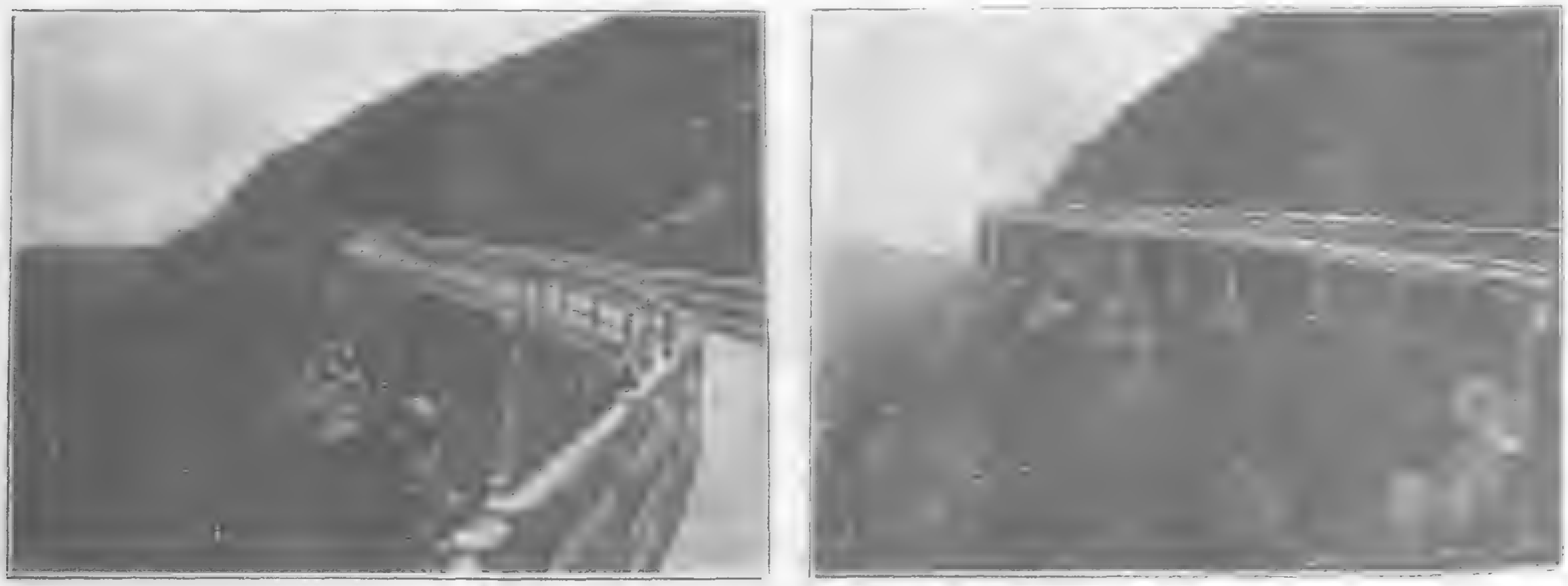


A Triumph of Road Building: Lugard Road, around the Peak at Hongkong, a Wonderful Scenic Highway.

Road Making in Hongkong

Developments Which Will Make Hongkong the Queen City of the Orient

HONGKONG is stirring itself to make the best of its natural advantages, not only as an industrial and manufacturing centre but as a place of residence and tourist resort. The Hongkong Hotel Company has taken the lead in many improvements which will make the colony more attractive to the traveling public. In addition to the beautiful resort at Repulse Bay, one of the most charming rest places in the whole of Eastern Asia, this enterprising company is now building a three-million dollar hotel at Kowloon, which will be opened in the winter of 1924; another up-to-date hotel is to be erected on the Shameen at Canton, the Peak Hotel is to be remodeled and new bus services put in operation. Kowloon is being developed into a delightful suburb for residences and industries, and one or two projects are well under way for the building of model groups of houses that in one instance will rise to the dignity of a new town. As a result of the investigations of an industrial committee many new enterprises are projected, amongst which is the establishment of a large iron and steel works, and the development of a great machinery manufacturing centre in the colony. Much of this future prosperity, however, depends upon closer relations and a better understanding with the neighboring province of Kwangtung, from whence the bulk of the raw materials must be drawn, and, as we pointed out in the April number of THE FAR EASTERN REVIEW, the recognition of this dependence upon



Reinforced Concrete Details of the Lugard Road Construction.



The Scenic Road Round Hongkong: View near Tytam Reservoir.

the mainland for its growth and prosperity, lies at the bottom of the recent agreement entered into between the Hongkong authorities and Dr. Sun Yat-sen. Hongkong's future is, therefore, much brighter at this time than any other part of China, and from all indications, the authorities are losing no time in preparing the colony for what lies before it.

The basis of Hongkong's growth lies in the excellent public works program, which in opening up territory with new roads has made possible the erection of many new and handsome buildings, and permitted the development of tracts in Kowloon for residential purposes. These splendid roads have transformed the island of Victoria into one of the scenic wonders of the Far East, rivalling in the beauty of the panoramas unfolded to the motorist, some of the more widely advertised scenic highways of other lands.

There are now 215 miles of road, of which 137 are used for mechanical transport. The material used for the construction is granite setts on concrete, 2-in. asphaltum sand carpeting of concrete, 2-in. asphaltum sand carpeting on macadam, macadam painted with asphaltum, and ordinary macadam. The roads are kept in good condition, and the average cost per mile of building is $70,000 for 20-ft. width. That for maintenance in connexion with all roads is $1,000. Granite sett or asphaltic mixture surfaces cost about 5c. per super yard. The minimum width of the main roads is 20-ft., the maximum gradient 1 in 7 (for a short distance only), but there are slopes of 1 in 20 three miles long. The colony is generally hilly, there being only a few flat gradent roads, but the ruling gradient for roads open to mechanical transport may be taken as being 1 in 20. The streams are all bridged, the structures are capable of carrying ten-ton loads, the minimum width, generally speaking, is 20-ft., and they are kept in good repair. In the city the maximum speed desirable for cars and lorries is fifteen and twelve miles an hour, and outside twenty to twenty-five and fifteen miles per hour.

The number of touring cars and commercial vehicles is about 551 and fourteen respectively. The government own one four-ton steam lorry of Aveling and Porter make, and two two-ton Dennis lorries; the former is run on coal and the latter on petrol, while the vehicles are used mainly for the conveyance of road-making materials. The steam wagon has been working since 1916, and has proved satisfactory, except for the smoke nuisance, due to the burning of Japanese coal. The Dennis lorries have been running since 1921, and have also proved successful. The price of steam coal per ton delivered is $19.50; coke is obtainable in small quantities at $32 per ton. Petroleum costs $5.22 for eight imperial gallons, and petrol $8.55 for eight imperial gallons.

Individual enterprise follows closely on the heels of the pioneer work of the public works department. The building boom carries with it new transportation schemes, and within the past month, two new autobus companies have commenced operations. The Hongkong and Kowloon Taxi-cab Company, Limited has been organized with a capital of $500,000 and will place in operation eighty Citroen Landaulette taxis by the end of the year. The first batch of thirty have been ordered and will be placed in operation sometime in June. These will serve not only the city of Hongkong but the suburban districts of Kowloon. In addition, the Kai Tack Motor Bus Company, Limited (a subsidiary of the Kai Tack Land Investment Company, Ltd.) has opened a service of six buses between Tsim-sha-tsui and Kowloon city.

In describing the road work of the public works department, the *South China Morning Post* says that it was the opening of the Shaukiwan quarry that made it possible to proceed with projected public works with much greater rapidity than would otherwise have been possible.

Shortly before the war it was found that contractors were not able to meet the heavy demand for road-making materials, forcing the officials to consider the possibility of supplying their own requirements from the splendid supplies of granite existing in the island, with the result that the quarry on the Shaukiwan road was started in 1914.

The increase in demand since that date has outgrown the capacity of the quarry, while the new 100 feet Shaukiwan road cuts through a large portion of the present site, necessitating the transfer of operations to a point further east which will have additional plant to increase the output. The new plant will include three crushers, two rotary drivers, two spiral mixers and an electric crane. There will also be a moulding shed capable of producing 940 granite paving slabs, workshop and garage for no fewer than six lorries, smithy, workshop for telephonic and electrical repairs; machine, furniture and carpenter's workshops, stores of various kinds, workmen's quarters, office and laboratory for testing road materials. The quarry has a productive capacity which should meet all needs for 30 years ahead.

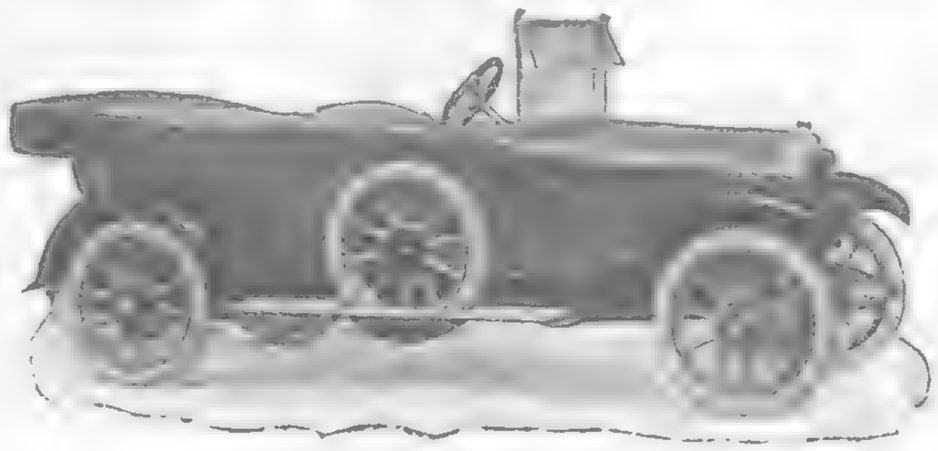


Road Around the Kowloon Territory.

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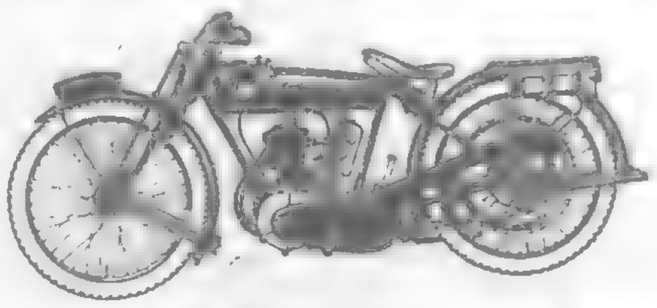
8 H.P. Light Car	...	£275	11.4 H.P. Saloon	...	£625
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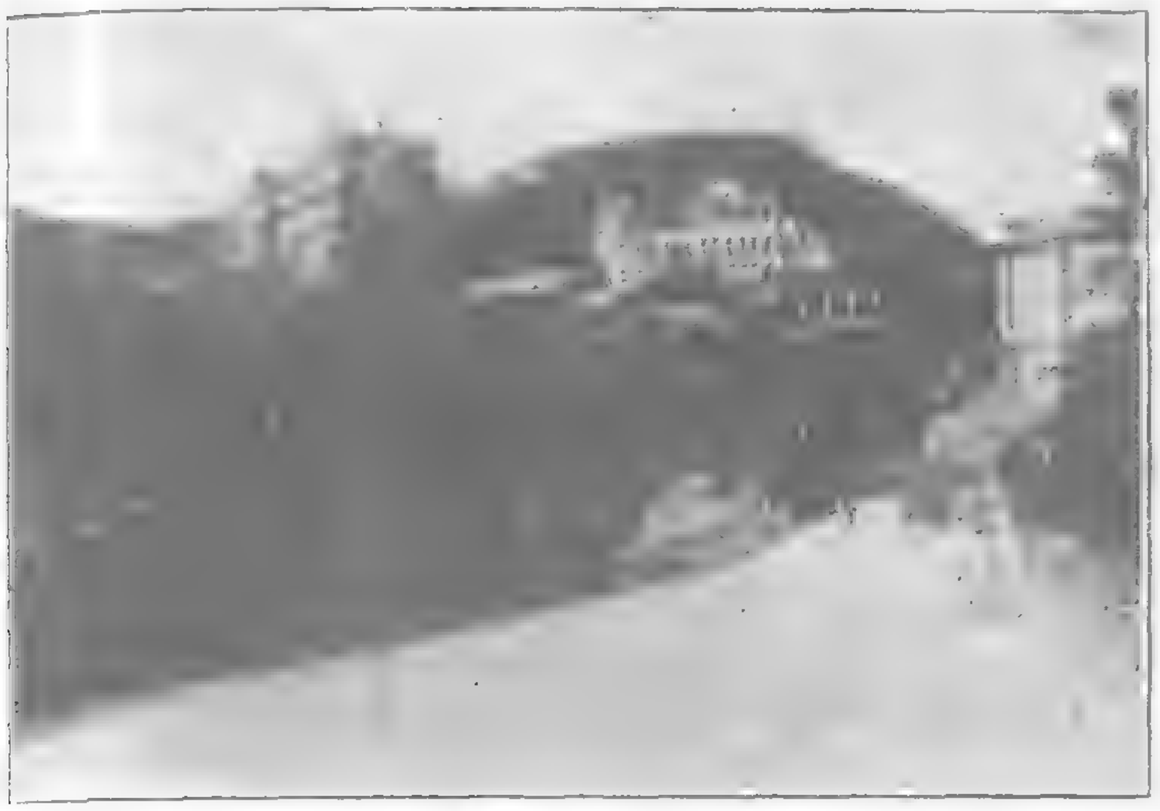
AFTER all, it isn't quite consistent to exercise a great amount of care in selecting your car and then ignore altogether the quality of motor oil that you put into it.

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SOCONY MOTOR OILS



A Road to the Peak.



A Road in the New Territory.

To produce the material fast enough to supply the growing needs the three new crushers will have to work continuously. The electric crane will eliminate unnecessary handling. This crane, by means of a projecting gib, will raise the trucks of granite from the face of the quarry to a level about 40 feet higher, where they will be placed on a track and run by gravity to the crushers, after which they will proceed, still by gravity, to their original position at the quarry face.

At the present time all drilling is done by hand but in the new quarry six Ingersoll-Rand compressed air drills have been installed. Each drill can bore six inches a minute and can perform as much work in two hours as nine men can do in one day under the old method.

After blasting, the stones were broken by the laborers into pieces of a size suitable for feeding the crushers. Upon leaving the crushers the granite is conveyed by a bucket elevator to revolving grading screens from which it drops into bins. From these bins it can either be drawn off on to a mixing platform or that required for transportation by water can be delivered by means of chutes into trucks. The material when delivered on to the platform is used for higher grade surfacing. Before it is mixed on the platform screen tests are taken to determine the percentage of each grade of stone, together with sand and cement,



Street Paving in Hongkong.

in order to arrive at as near as possible to maximum density. It is then deposited through a hopper into a rotary dryer where it is heated to a temperature of 350 degrees F, after which it is drawn off into another hopper of known capacity and the requisite amount of asphalt, heated to the same temperature is then added. The levers of the hopper are then drawn and the whole of the ingredients are thoroughly mixed by the aid of a mechanical spiral mixer. From the time it leaves the quarry till it is placed on the roads great care is taken by conveying the material in covered vehicles to ensure it being laid at a temperature of not less than 250 degrees. Ten thousand tons of tar macadam will be laid on Stubbs Road alone during the current year.

Very little material is wasted in the quarry, the residue of the crushing being carefully screened and utilized together with cement utilized in the manufacture of paving slabs. The present output is about 6,000 slabs a month or 200 a day but in the future it is hoped to turn out not fewer than 300 a day.

All the reinforced concrete piles for government work are made here whilst some outside firms are also supplied with them.

Materials are being supplied at feverish haste, road making goes on apace and as a result durable and spacious thoroughfares are springing into existence.



Automobiles Parked in the Square, Hongkong.



Motor Buses at the Kowloon Ferry.

With these new projects to be effected, the all important necessity for maintaining existing roads and the ever pressing building problem to be solved, the public works department is one of the busiest concerns in the colony. Under-staffed as it is, it is exceedingly difficult to keep pace with the work which has been planned for years ahead.

Among the many schemes the following are the most important: Improving and widening the road through Quarry Bay Village, widening of the Wanchai Road to 42 feet, improvement of the Shaukiwan Road in Shaukiwan Village, Victoria Road improvement, the construction of a road contouring the hillside above Conduit Road (first section) and another road connecting Broadwood Road with Wongneichong Gap Road, the widening of Queen's Road East to 60 feet, Kennedy Road improvements and widening of the Bonham and Conduit Roads. In addition there is the surfacing of the main roads of the city with asphalt, the surfacing of the Peak Road for heavy traffic and the surfacing of sections of the Pokfulam Road, including part of the road touching Aberdeen Village.

Naught but a trip in a motor car to the districts where road making and improvements are being effected will enable one to appreciate the great advantages accruing from these activities. Few people are acquainted with the shy beauty spots existing off the beaten track which are being taken up by new building sites which command wonderful prospects.

Further facilities are being afforded to get from the central part of the city to Repulse Bay via Stubbs Road and Wong Nei-chong Gap. When this is completed the island will possess another highly important thoroughfare.

Another improvement is the widening of the approach to the Beach Road at Repulse Bay. While three parking grounds for cars have been constructed on his road to accommodate 45 vehicles, 15 to each ground.

Thirty years ago such highways as are now being constructed on the island and mainland were not thought of in any country, concludes the *South China Morning Post*, "The development of automobile traffic led to their construction. Motor traffic has already appeared on the Hongkong roads and in the imminent future with the appearance of taxicabs will be largely increased. Thus the roads now constructed have to be especially adapted to the new conditions which called for harder and more durable material than was deemed necessary in the past. The foresight of our P.W.D. in this respect will become more apparent when the traffic conditions in the colony still closer approximate to western standards."

Roads, Bridges and Transportation in the Antung District

(Continued from page 490)

arrangement:—The estimated cost was 75,000 yen, 10,000 of which the Chinese or customs agreed to pay, the remainder to be paid by the South Manchurian Railway Company. The Okura-Gumi was appointed contractors, and while they supervise the construction, parts of the work have been sublet to Chinese contractors. Owing to the soft nature of the soil composed of muddy silt deposits from the Yalu, it was extremely difficult to get a foundation sufficiently strong to support the piers.

The excavation work was started in April 1922. Strong wooden piles were driven into the mud, powerful pumps and gangs of coolies were employed pumping out the silt, and many hundreds of tons of cement and rocks were dumped into the foundation before it became solid enough to support the structure. It is expected that this bridge will be finished and open to traffic in a few weeks.

There are some other bridges over the creeks on the road to San-tao-lang-t'ow, as also steel bridges in Antung over which the South Manchurian Railway runs, the material being supplied by Dorman Long & Co., Ltd., Middlesbrough.

San-tao-lang-t'ow (Three wave heads) is about 20 miles from the mouth of the Yalu river, situated on the right bank about ten miles by road from Antung. There is good anchorage and room for several steamers to lie safely in rough weather. The obstruction to navigation in the river between San-tao-lang-t'ow and Antung is known as the Wu-Tao-Kao-bar (fifth creek). The creeks on the Chinese side or right bank of the Yalu are numbered, beginning from the big east creek known as Ta-Tung-kow near the mouth of the Yalu; the boundary bridge mentioned above spans the 7th creek (Chi-Tao-kao) near the Antung custom house.

Until the Wu-Tao-Kao bar be removed, boats of more than 4-ft. draft will have trouble crossing the bar, coming and going to and from Antung, during low water. The removal of the bar would be a simple dredging operation, but whether it would be successful or not depends on how the river would act afterwards.

The future prosperty of San-tao-lang-tow depends on better communication with Antung, this could be accomplished at little cost by making or improving the road. The rock at Mou-Kwei-San (Helmet hill) being of a brittle nature is easily broken. This hill is midway between Antung and San-tao-lang-to'w, and would provide good road-making material. The pass at Mou-Kwei-San which is cut through the hill is not wide enough for two carts to pass each other, the north bound traffic must wait until the south bound carts come down or *vice versâ*.

It seems strange that this main artery of trade and passenger traffic has not been attended to before now, when this road is made, the passenger traffic, at any rate, between Antung and San-tao-lang-t'ow will be solved and motor-cars will then carry passengers and expensive cargo for the steamers lying at San-tao-lang-t'ow.

With better communication by road, San-tao-lang-to'w is destined to enjoy prosperity and owing to its high elevation overlooking the river a better site for city or town could not be found. It is never flooded by the Yalu waters and the drainage question which is now the great trouble in Antung would be avoided; there are indications of San-tao-lang-to's becoming a prominent gateway for the water-borne cargo of Manchuria when the road which is now under construction be finished.

To develop this locality in company with the Japanese, a Chinese McAdam with money and authority is wanted.



The Great Railway Bridge over the Yalu River at Antung connecting China and Korea

NEW IMPERIAL

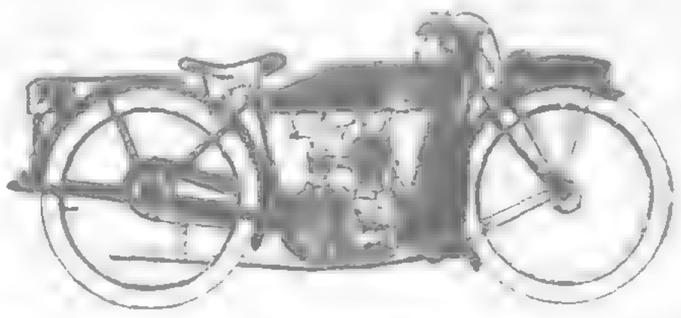
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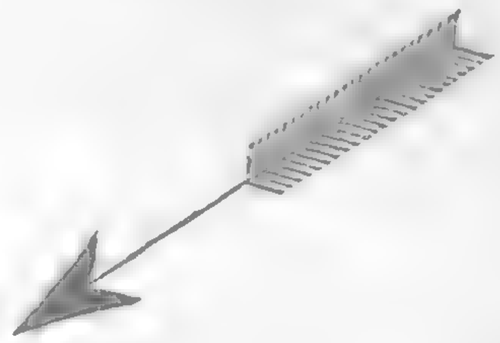
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THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF THE INTERIOR
CITY OF MANILA

FIRE DEPARTMENT
CENTRAL OFFICE

May 12, 1922.

Mr. F. R. Van Rensselaer,
Export Manager,
American-LaFrance Fire Engine Co. Inc.,
Elmira, New York, U. S. A.

Sir:

In compliance with your recent request, I am inclosing a snapshot of our American-LaFrance four-wheel drive aerial which is coming into her own as five-story reenforced concrete buildings are being erected all over the city and there is quite a colony of them in the down-town districts, towering far above the little-tiled roof (firemen's nut-crackers) picturesque buildings of former Spanish architecture.

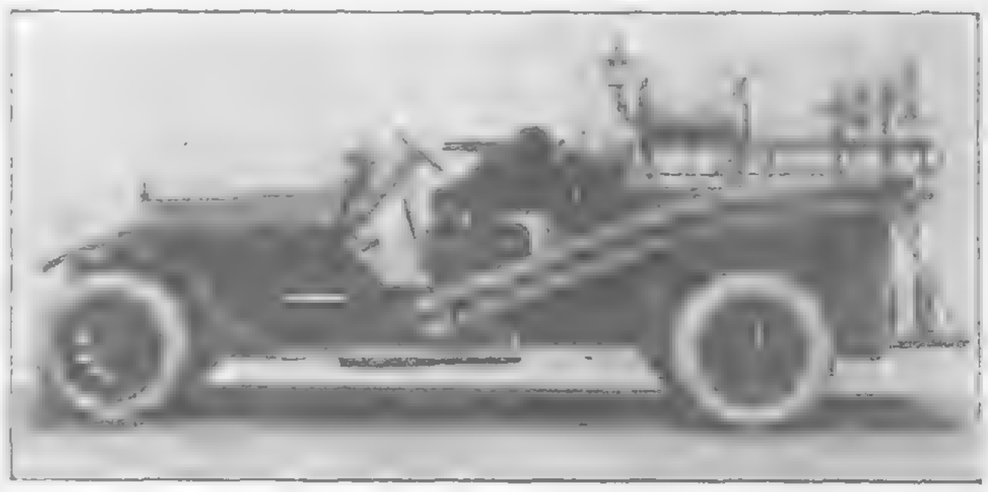
I am also inclosing a snapshot of our latest "HE" Pumper, an American-LaFrance 75 which is engaged in the rather tame performance of testing-out a newly installed Underwriters' Stand-pipe.

The two above LaFrance apparatus are second to none in this department.

Very respectfully,

OTIS L. VANDERFORD,
Chief, Fire Department.

Our equipment has been perfectly successful in the city of Manila. It is proving its merit the world over.



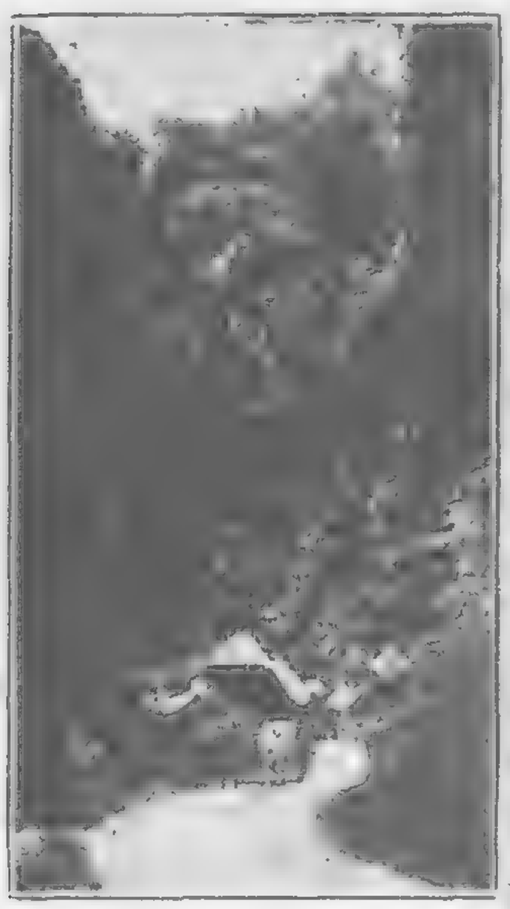
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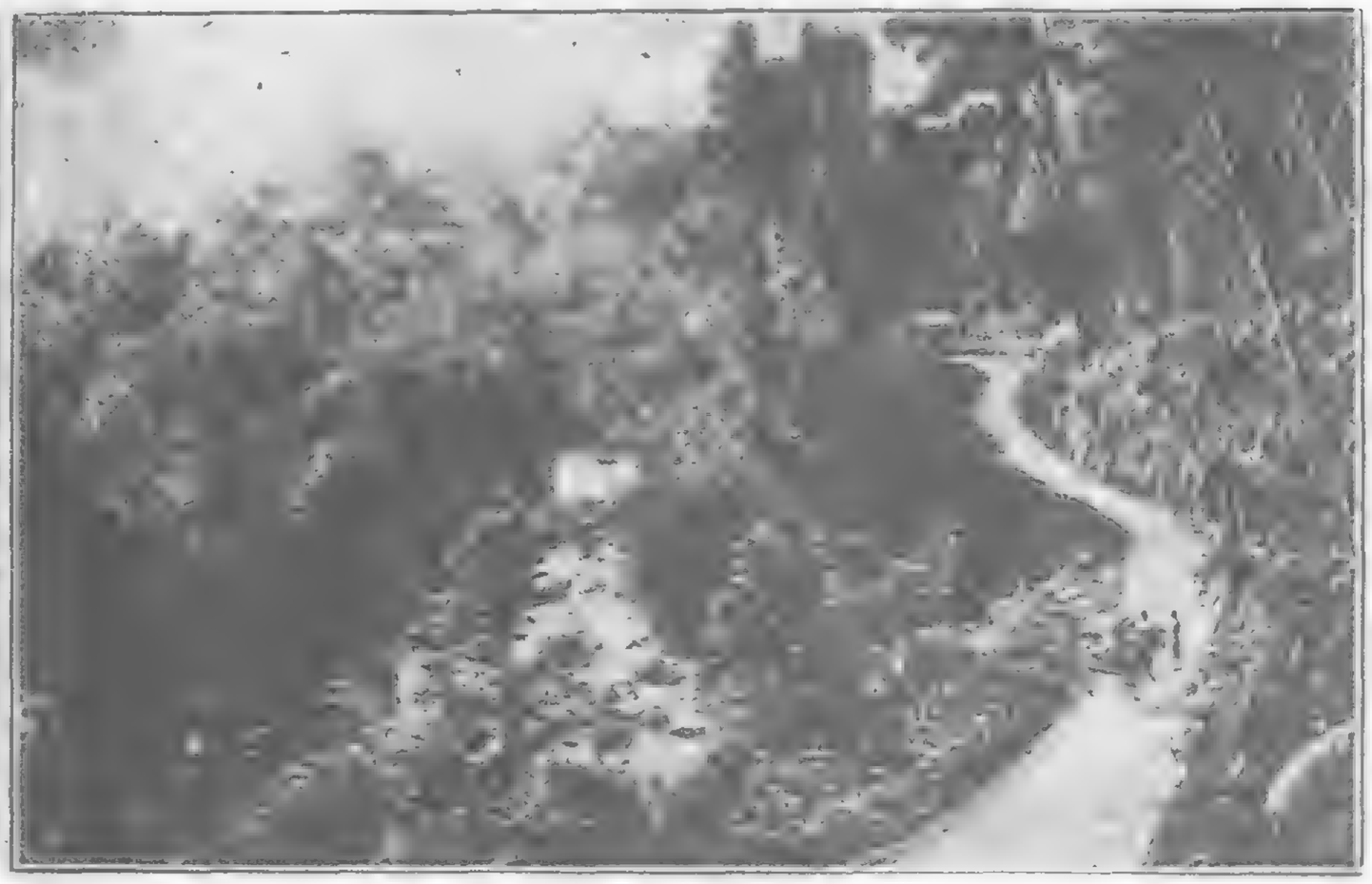
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On the Kuala-Kubu-Kuala Lipis Road.



Road through the Hills of Malaya.



Motor Service, Kuala Kubu-Kuala Lipis.

Roads and Autos in British Malaya

Straits Settlements Roads

THERE are 621 miles of metalled road in the Straits Settlements and 92 miles of unmetalled. There are approximately 8,000 cars and 2,000 commercial vehicles in use; these figures show an enormous increase on those returned in 1914, when the respective totals were 2,115 and 186. The government now own eight cars and fifty-nine lorries.

PARTICULARS OF GOVERNMENT VEHICLES

4	Napier Mail Vans	2½ tons	.. Transport of mails.
1	Denby Mail Van	2½ ,,	.. ,,
1	Denby ,, ,,	1 ton	.. ,,
2	Guy Mail Vans	2½ tons	.. ,,
2	Ford ,, ,,	12 cwt.	.. ,,
6	Ford ,, ,,	1 ton	.. ,,
3	Dennis Lorries	4 tons	.. Transport of road metal and stores.
12	,, ,,	3½ ,,	.. ,,
1	Dennis Lorry	2 ,,	.. ,,
4	Denby Lorries	2½ ,,	.. ,,
13	,, ,,	2½ to 3 ,,	.. ,,
2	,, ,,	2 ,,	.. ,,
3	,, ,,	1 ton	.. ,,
1	Guy Lorry	2 tons	.. ,,
2	Daimler Lorries	2½ ,,	.. ,,
1	Vauxhall Limousine	..	.. For the governor's use.
1	Austin Touring Car	..	.. ,,
1	Ford Touring Car	..	.. For the use of the governor's staff.
1	Ford 1 ton Truck	..	.. For transporting government house goods.
1	Oakland Touring Car		.. For the use of the colonial secretary.
1	Ford ,, ,,		.. ,,
1	Daimler ,, ,,		.. For the use of the resident councillor, Penang.
1	Austin ,, ,,		.. For the use of the resident councillor, Malacca.
3	Ford Touring Cars	..	.. For government use in Malacca

All the above vehicles are run on "Shell" benzine.

The loads are usually made up to two tons. Passenger fares on local omnibuses work out at three cents per mile; transport of goods is not charged by weight, but lorries are hired by the hour, and the average charge is $3 per hour. Running costs of cars are given as about 22 cents per mile and those of lorries 50 cents per mile, inclusive of interest and depreciation. The metalled roads are made of granite and laterite, and are kept in good condition. The average cost per mile of construction of a laterite road is $20,000, and of a metal road $45,000, while annual maintenance comes out at $900 per mile. The minimum metalled width is 12-ft., and 14-ft. is allowed between side drains. The condition is dusty in dry weather and muddy in wet. The surface soil is argillaceous red earth, which when dry is hard and when wet is very soft. The ruling gradient is 3⅓ per cent., on main roads the maximum gradient is 6¼ per cent., on tracks 12½ per cent., and long gradients are exceptional. The bridges have a minimum width of 14-ft. and will carry 10 tons. There are no streams to be forded, but roads are occasionally flooded to a depth of 12-in.

The maximum altitude above sea-level of any motor road, with the exception of 685-ft. in Penang, is 300-ft. The speed limits recommended for cars and lorries are 20 and 10 miles per hour.

Natives drive all the government vehicles, and with European overseers are capable of doing repairs. Labor obtainable is Chinese, Tamil, and Malay, while as to wages Europeans get from $250 to $600 per mensem and natives $40 to $160 per mensem. In Singapore and Penang there are workshops capable of overhauling any mechanically propelled vehicle, while the other settlements have a number of shops which are able to deal with car and lorry repairs. There are facilities available for putting on or removing solid rubber tires, and any timber used for the framework of lorries should be well seasoned to withstand exposure to tropical heat.

On the roads there are wells and streams at convenient intervals which form the roadside water supply, and in the towns there are properly regulated supplies. Japanese coal costs $18 per ton, Australian $24.50 per ton, and coke $45 per ton. There is no benzol or commercial alcohol in the market, but petrol is obtainable at $1 per gallon, petroleum from $3.35 to $3.65 per 4-gallon tin, wood at $10 per ton, and oil fuel at $14,50 per 67-gallong drum.

The Malay peninsula is an exceptionally rich country, and, if money be invested in road and railway development and enterprise is encouraged, there will be great scope for progress not only in existing and established industries, but also for the promotion of others.

Trunk Roads

British Malaya possesses an excellent road system. A main trunk road runs from Prai (on the mainland opposite Penang) down the length of the peninsula, through Malacca to the borders of Johore. This road has now been extended northwards to the Siamese boundary in Perlis, and will be carried southwards to Johore

Bahru and connect by ferry with Singapore. A proportion of this extension, which is a formation 25-ft. wide, metalled to a width of 16-ft., has already been completed, and as the ruling gradient does not exceed 1 in 40 it should make an excellent motor road. Road surfaces in the states generally are good, but in some districts the roads are narrow, with a succession of sharp bends which, in view of the slow-moving bullock traffic, need careful manipulation. The best time for motoring is during the dry season, which lasts from April to September. The temperature, which varies from 70 deg. to 90 deg. F. in the shade, keeps within these limits throughout the year. The hours of daylight are unchanging all the year round; it is light at 6 a.m., and lamps must be lit at 6 p.m. Generally speaking, no special type of car is required for the Malay States, but a tropical radiator should always be fitted. Petrol and tires can be obtained in practically every town.



A road through the luxuriant vegetation of the Pahang Hills.

The metalling used in Perak is granite, laterite, limestone, and quartzite, and the mileage is about 860 of metalled road and about 76 of the unmetalled kind. The average cost of construction is $15,000, and of maintenance per mile per annum of metalled roads $1,350 to $2,250. The roads are never dusty or muddy; they are kept in good condition, and the minimum width is 24-ft. The ruling gradient is about 1 in 40, and the maximum and longest gradient is over Kuala Kangsar Pass, this being 1 in 17.35 and about a mile and a half long. There are no streams to be forded, and on a bridge the clear roadway of which does not exceed 20-ft. in width one load of 10 tons can be carried on four wheels. The width of the bridges, which are kept in a good state of repair, is 20-ft. on main roads and 18-ft. on branch roads. As may be judged from particulars given above of gradients, the maximum altitude above sea-level of any motor road is not sufficien to cause any serious loss of power, being only 475-ft.



A limestone quarry site at Batu Gua, in Pahang.

Labor Supply

The approximate number of private cars is 608, of hired cars 710, of lorries 70, and of motor-omnibuses 13. The government owns no cars, but runs 73 commercial vehicles, particulars of which are given below. There appears to be no fixed rate for goods cartage, but passengers are conveyed at 5 cents per mile. The Ford car has proved popular, largely on account of the facilities for obtaining spare parts. The cost of petrol is $1.10 per gallon, of petroleum 95 cents per gallon, and of wood $6 per ton. Usually, water is not obtainable easily by the roadside, but there are piped supplies in the towns, and the water is very soft. Natives are used for driving the government lorries, and under European supervision they are adept at running and repairing motor vehicles. The labor obtainable is Malay, Chinese, Tamil, Singalese, and Javanese. Native mechanics get from $1 to $5 per day. At Ipoh there are facilities for dealing with solid tires, and there are numerous workshops in Perak. Local hard woods are better than teak for body-framing.

PARTICULARS OF GOVERNMENT VEHICLES.

Particulars of Vehicle.	Use made of Vehicle.
6 Clydesdale Lorries (2½ tons)	Carting metal.
10 Dennis Lorries (3½-4 tons)	Carting metal.
5 Denby Lorries (3 tons)	Carting metal.
1 Ford Tractor (1 ton)	P. W. D. transport.
25 Clydesdale Lorries (3 tons)	Conservancy, scavenging, abattoir, water cart, and metal carrying.
9 Dennis Lorries (6 tons)	Metal carrying.
1 Sunbeam Ambulance	—
6 Clydesdale Lorries	Conservancy and scavenging.

Petrol used in every case.

The mileage of the metal roads in Selangor is 613, of gravelled 65, and of unmetalled 18. For metalling, laterite, granite, limestone, quartzite, and sandstone are used, and the surface soil varies from hard clay to peat. The condition of unmetalled roads during the wet weather is very bad. As regards mud and dust, conditions alternate throughout the year; laterite roads are more dusy and muddy than those made of limestone or



Placing an Armco culvert in a British Malayan Road.

Map of Singapore

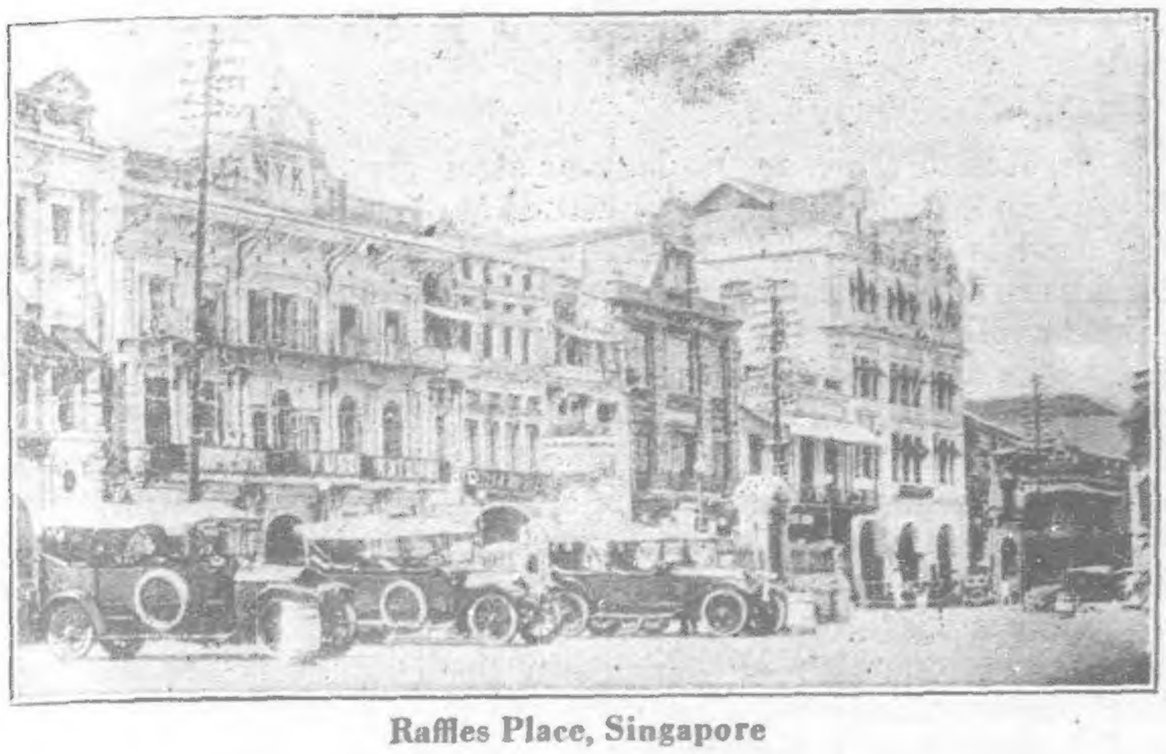
granite. The minimum width in cuttings is 19-ft., and 22-ft. on embankments. As to costs, the average per mile of construction works out at $11,100, and for maintenance per mile per annum at $525. The maximum gradient is about 1 in 20, the ruling gradient 1 in 25, and the longest slope 12 miles. As a rule there are no streams to be crossed except when rivers overflow. The roads may then be flooded to a depth of three feet or more in certain localities for short periods. The bridges are well kept, are built with a minimum width of 12-ft., and on main roads will take loads of from 10 to 20 tons. About 3,500-ft. is the maximum altitude; 25 miles per hour is the maximum desirable for cars, and if due regard be given to the avoidance of damage to roads the limit for 3-ton lorries should not exceed 12 miles per hour.

Use of Lorries

Touring cars in Selangor number 1,612 and commercial vehicles 134, of which the public works department owns 36. These lorries are used for transporting road material; the loads vary from 1 to 3 tons according to the capacity of the machines, and the following are the makes employed :—Albion, Halford, Dennis, Ford, Thronycroft, Vulcan, Guy and Foden. All are run on petrol with the exception of the last named, which burns firewood. Lorries of a carrying capacity of three tons or under have proved the most successful on granite and limestone roads. On laterite and gravel roads the load carried should not exceed one ton, as heavier traffic has been found to damage the foundations. It is impossible for vehicles to traverse the country off the roads. In connexion with running costs the following data may be taken as a guide. Cars 35 to 45 cents per mile, 3-ton lorries 30 to 50 c.p.m., Ford 1-ton lorries 20 to 30 c.p.m., inclusive of wages, repairs, and depreciation. Coal is priced at $8 to $13, coke at $60 per ton, petroleum $0.94c. per gallon, petrol at $1.10c. per gallon, and wood at $6 to $7 per ton. There is an abundant supply of clean water. Teak is not essential for bodies as other hard woods may be used. Numerous



A Malayan Garage and Motor Works: Office of the Central Malaya Engineering and Motor Works at Kuala Lumpur.



Raffles Place, Singapore

workshops capable of dealing with repairs exist, and there are means available locally for fitting solid rubber tires. Natives can be used for driving and looking after cars and lorries and receive from $1 to $2 in wages; Europeans in a supervizing capacity get from $250 to $400 per month. The labor obtainable is Malay, Javanese, Chinese and Indian.

Trailers

In Negri Sembilan there are 596 motors of the touring kind and twenty-four of the industrial type. The government owns one car, five ambulances, and seventeen lorries. The car is of Sunbeam make and is used by the resident on duty; the ambulances are of Sunbeam and Ford manufacture, and the lorries, employed on the transport of road metal and conservancy work, are 30 cwt. Albions. As to rates and running costs, passenger conveyance works out roughly at 6 cents per mile, the Albion lorries cost about 40 cents a mile, and, depending on weight, etc., the operation charges of touring cars vary from 25 to 45 cents. The use of more than one trailer at a time has not been found satisfactory owing to the short radius curves on the roads. The mileage of metalled roads is 433, of unmetalled nine, and there is a considerable mileage of private estate roads. The roads are dry and slightly dusty, are kept in good order, and granite and laterite are used for metalling. The cost of constructionaver ages $15,000 per mile, and the annual cost per mile for maintenance is $1,400. Where the roads are not metalled the surface soil is soft. The minimum width of the roads is 16-ft., the maximum gradient is 1 in 20, the ruling gradient is 1 in 30, and there are slopes up to three miles in length of 1 in 30. The bridges have a minimum width of 18-ft. and will carry fifteen tons. There are no streams to be crossed by fording, and 1,300-ft. forms the maximum altitude above sea level. The speeds recommended are thirty-five miles an hour for cars and fifteen for lorries. There are no particular difficulties experienced in getting repairs done or solid tires fitted, and Chinese, Tamil, and Malay labor is obtainable, and capable of effecting repairs in addition to operating motor-vehicles. Chinese mechanics are paid $1.50 to $3 per day. Teak is not essential for the framework of wagon bodies, and as to roadside water supply, streams are plentiful. In towns the supplies, which are good, are from public standpipes. Thew ater is very soft, but roadside streams are usually heavily laden with mining silt. Benzol and commercial alcohol are not available, but coke costs $55 per ton ex-Singapore, petroleum $0.88c. to $0.99c., petrol $1.15c. to $1.30c. per gallon, and wood $4.50c. to $5.50c. per ton.

Heights of 3,000 Feet

In Pahang there are 358 miles of metalled road and forty-three of unmetalled. The hill roads cost on an average between $20,000 and $30,000 per mile of construction, and the ordinary roads $12,000 to $15,000. The materials used for metalling are limestone, schist, granite, trap, quartzite, laterite, and mining metal. The annual cost per mile for maintenance is $1,321.68c. The roads are kept in good condition and are dry, but mechanical transport should only be used on metalled roads. The nature of the surface soil is brown clay and ironstone gravel, and the condition may be described as fair. The minimum width of metalling is 12-ft., and of earth cuttings 22-ft. In respect of gradients, the maxi-

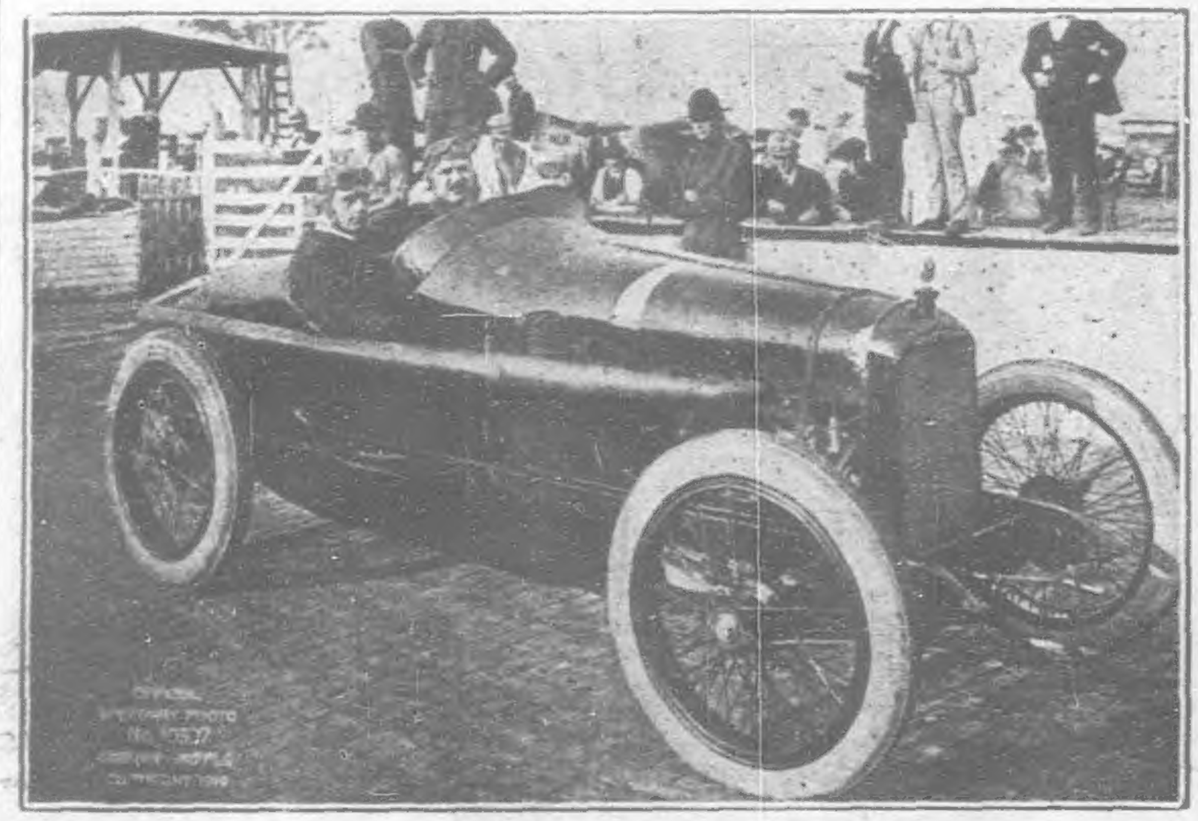
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No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



"Many times Dixon's Graphite Automobile Lubricants have pulled my car through a trying race without lubricating difficulty."—LOUIS CHEVROLET.

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Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

Sold in one, five and ten pound tins. Larger packages if desired.

mum on first-class roads is 1 in 40, and on second-class 1 in 30; in a few places there are gradients of from ten to fifteen miles in length. There are no streams to be passed through and the iron bridges will carry forty tons and those constructed of timber ten tons. They are kept in good condition, and the minimum width of bridges of the first class is 20-ft., while that of the second class is 2-ft. less. The maximum speed desirable for motor-cars is 30 to 35 m.p.h. and of lorries 12 to 15 m.p.h. The maximum altitude to which motor-vehicles have to ascend is about 3,000-ft.

Coal, coke, benzol, and commercial alcohol are not used. Petroleum costs $4.15c. per tin of "Fish" brand oil, petrol $1.30c, per gallon, and wood (per thousand pieces 18 × 2 × 2-in.) $6.34c. There is a plentiful supply of good soft water. The number of touring cars is 113, and of commercial vehicles thirty-nine. The government owns two of the former and eleven of the latter class: and some particulars of these are given below. The steam tractors and petrol lorries have both proved successful, but lighter vehicles are preferred owing to the nature of the road construction. Hired cars run by private enterprise have no fixed rates but vary from 5 to 10 cents per mile per passenger, while cheaper rates are usually quoted on popular routes. There are government and private repair-shops. Motors are driven by natives, and repaired by them under European surveillance. The labor is Chinese, Malay, and Indian, and native mechanics get $45 to $90 per mensem. Teak is not necessary for body-work.

Particulars of vehicle.	Use made of vehicle.	Running cost per mile.
3 Ton Albion lorry	Transport of road materials, etc.	.51 cents
3½ „ „ „	„	.37 „
1 „ „ „	„	.81 „
2 „ Vulcan lorry	„	.85 „
1 „ Ford lorry	„	.42 „
1 „ „ „	„	.55 „
4½ „ Traction engine	„	.83 „
*4½ „ „ „	„	—

*Under repair during the year. All these are run on petrol with the exception of the traction engines, which use firewood.

4½	Traction engine	Transport of road materials, etc.	1.53	cents
1	„ Ford lorry ..	„	.43	„

In Kedah there are no long or steep gradients, the maximum being 1 in 30, and the highest altitude above sea level of any motoring road is 600-ft. The speed limits recommended for cars and lorries are 30 and 12 miles per hour respectively. Two hundred and seventy miles of road are metalled, and there are 111 miles unmetalled. The average cost of construction is $15,000 per mile and of annual maintenance approximately $1,125 per mile. Limestone and granite are used for metalling; the roads are well kept, and at different seasons are dry, dusty, and muddy. Then nature of the surface soil is clay. The roads are formed with 24-ft. width and 12-ft. of metal. The bridges will carry 10 tons on one axle, and have a minimum width of 16-ft. There are no rivers to be forded. The approximate number of vehicles in the country is 393 cars and thirty-seven utility vehicles, of which the government owns three and twenty-four respectively; these are used for transporting P.W.D. material, and consist of eight 3-ton Albion (run on paraffin), five 2½-ton Dennis, eight 1½-ton Albion, and three 1-ton Ford, the last sixteen mentioned vehicles being operated on petrol. Petroleum costs 95 cents per imperial gallon, petrol $1.05 per similar quantity, and wood $1 per 100 pieces, each piece weighing at least 2½-lb. No trouble need be experienced as regards water supply in the country, and there are pipes in the chief towns. There are no facilities available locally for dealing with solid rubber tires, but, as regards repairs, there are small P.W.D. shops. Natives are employed in running and repairing vehicles; their wages run from $2 to $3 per day, and the labor obtainable is similar to that in Negri Sembilan—namely, Chinese, Tamil and Malay. Usual hard wood is suitable for body work.

Motor Vehicles in Johore

The number of cars in Johore is about seven hundred and of commercial vehicles 120. The government owns 150 of the former type and seventy of the latter kind. The work is of a general transport nature, consisting of the conveyance of government

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No. 50. IRON. Loading 500 Watts. Weight 6lbs.

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Strong Tip-up Stand.
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officers, of stores, and of road-making material. All the vehicles are run on petrol, the prevailing price of which is similar to that charged in the Straits Settlements. This also applies to the cost of coal and petroleum, etc. Lorries operate for about 25 cents per mile. The passenger rate per mile per seat is 9 cents, or $3 to $4 per hour per car ; and goods 4 cents per mile per picul. The water supply is by pipe and well ; water is usually clean, and obtainable by the roadside.

Of metalled roads there are 576 miles, and 62 of unmetalled. For the former granite and laterite are used, and a minimum width of 20-ft. is provided. The roads are kept in a good state, and are dry for six months and wet for the remainder. The unmetalled roads are fit for motor traffic only in dry weather. The average cost of building the roads is $18,000 per mile, and of maintenance $1,000 per mile per annum. There are no long gradients ; the maximum is 1 in 20 and the ruling gradient 1 in 25 ; nor do vehicles have to ford any streams. The bridges are well looked after, have a minimum width of 16-ft., and are capable of carrying 12-ton loads. The highest altitude is under 500-ft., and 30 and 10 miles per hour are about the maximum speeds desirable for cars and lorries.

Teak is not essential for body work, but is preferable. Natives can undertake the running and repair of motors, and receive $1.25 to $2.50 per day. There are no local facilities for pressing on and off solid rubber tires, but there are P.W.D. workshops which deal with repairs. The labor obtainable is Tamil, Chinese and Malay. The following are among the makes and types of vehicle run by government :—

1-ton Ford.	30-cwt. Albion.
Ford cars.	2-ton Leyland.
30-cwt. Denby	5-seater Studebaker.
2-ton Vulcan.	3-seater Wolseley.
2-ton Dennis.	3-seater Arrol Johnston.

In the Federated Malay States, together with Kelantan and Kedah, the government in 1914 owned eighty-two cars and eighteen commercial vehicles, which comprised the following makes :—

(*a*) Touring Cars.

Wolseley, Napier, Austin, Sunbeam, Siddeley-Deasy, Ford, Studebaker, running on petrol and used for conveyance of government officials.

(*b*) Motor Lorries, etc.

Halley 2 ton Albion 16 H.P. and 30 cwt. and 2 ton) Lacre 2 ton Straker-Squire 3 ton Halford 24 H.P. Leyland Dennis Fire Engines Thornycroft Motor Watering Carts	Petrol and paraffin. Used for carrying road metal and P.W.D. materials.

(*c*) Steam Wagons, etc.

14 Foden Steam Wagons 22 Aveling and Porter Tractors and and Traction Engines	Wood fuel. Carrying road metal, etc.

Since 1914 the government have bought the following :—

Negri Sembilan	14	30 cwt. Albion Lorries
Kedah	8	2½ ton Albion Lorries
	1	16/20 h.p. Wolseley Touring Car
Selangor	5	3 ton Halford Tip Wagons
	1	30 cwt. Albion
	4	Merryweather Fire Engines
	1	Merryweather Hose Tender
	1	Lacre Police Patrol Wagon on 2-ton Chassis
Other States	6	30 cwt. Albion Lorries (Prai)
	3	25 h.p. Crossley Motor Ambulances (second-hand for local military force)
	1	Merryweather Fire Engine
	1	Crossley R. F. C. Model Touring Car
	1	Stellite 3-Seater
	1	20 h.p. Napier Touring Car
	1	20 h.p. Napier Mail Van

The total value of imports to the F. M S., January, 1921-January, 1922, was £12,018,137, and from the United Kingdom £3,103,039, and the total value of exports was £15,806,627, and to the United Kingdom £1,645,069.

Kelantan has fifty miles of metalled and sixty-five of unmetalled roads, and there are approximately forty-five cars and four lorries run by the government. In Trengganu the cars number thirteen, exclusive of three government commercial vehicles, and Perlis has twelve cars and one motor lorry. Altitude is not of importance in any of the three states, the highest (140-ft. above sea level) being in Kelantan, and, as may be judged, there are no severe or long gradients. Roads are kept in fair condition, as are also the bridges. There are no completely equipped workshops in any of the three places ; the water supplies are sufficient, through in Trengganu the water is not always clean. The price of petrol in Kelantan is given as $1.02½ per gallon, in Perlis as $1.10 per gallon, and in Trengganu as 2s. 10d. per gallon.—*Times Trade Supplement.*

Petroleum in the Dutch East Indies

Indications of petroleum were discovered in Boeton, southeast of the Celebas, several years ago, but because of its remoteness and the difficulty of procuring coolie labor, a comprehensive survey has never been made. The Dutch colonial government is about to make an investigation there in order to determine the extent of the deposit.

Korean Railways May Consolidate

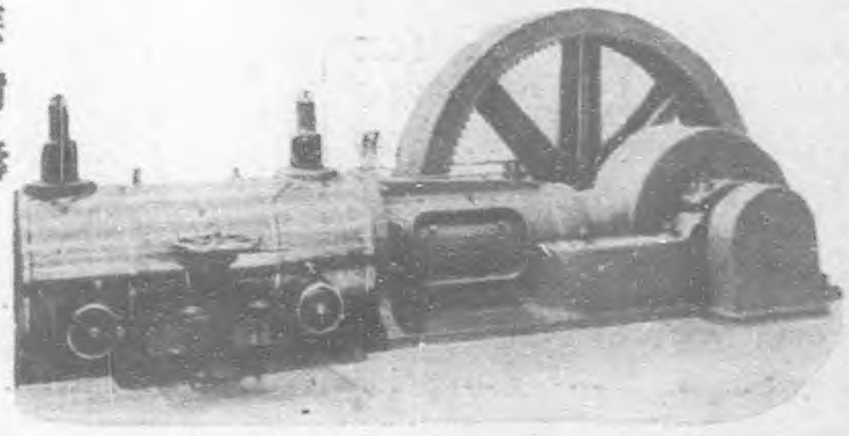
It is reported that negotiations for the amalgamation of eight privately owned Korean railways are under way, but as the plan must be submitted to the shareholders of each company it is not expected that the organization of the new concern will be completed before August or September of this year.

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Textile Mills	1,168	Telephone Systems	73	Rice Mills	321	Aerated Water	38
Lumber	597	Gas Works	69	Ice & Cold Storage	88	Electric Supplies	43
Match Factories	151	Waterworks	238	Egg Factories	20	Ceramic Works	44
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